4.0 HAZARD SPECIFIC DISCUSSION

4.1 Chapter Purpose

In this chapter, the hazards that are managed at the Savannah River Site (SRS) are discussed in terms of their current states—their origin, nature, form, and amount—and the end states that will be achieved for each hazard by the end of the currently planned Environmental Management (EM) Cleanup Program.

First, each hazard category is discussed. This discussion explains the current hazard, whether it is a contained hazard or released hazard, the risks, the planned end state, the controls that are in place for that hazard, and references for those controls. Next each watershed is discussed with hazard-specific information provided. In the last major section, each SRS industrial area is described in terms of the hazards present there now and the hazards that will remain in each area at the end of planned EM cleanup.

SRS hazards are organized into five major classes. The five classes are further subdivided into fourteen categories:

- **Nuclear Materials:**
  - plutonium,
  - uranium,
  - spent nuclear fuel, and
  - tritium
- **Radiological Waste:**
  - high level waste (HLW),
  - transuranic (TRU) waste,
  - low level waste (LLW) and
  - low-level mixed waste (LLMW)
- **Non-Radiological Waste:**
  - hazardous and
  - sanitary waste
- **Inactive Waste Units:**
  - contaminated soil and
  - groundwater
- **EM Facilities:**
  - nuclear, radiological, other industrial facilities and
  - high level waste tanks

The objective of Chapter 4 is to provide the greatest level of detail at the most appropriate scale of SRS hazards and their respective end state. SRS has elected to present all individual hazards through Conceptual Site Models (CSMs) at the appropriate watershed or area scale. The watershed scale is used to depict groundwater plumes and facilities in the general site area (G Area). This scale is appropriate for these two hazards due to the extensive area that groundwater plumes encompass and the fact that G-Area facilities represent the remaining area within a watershed outside of site process or industrial areas. The area scale is appropriate to focus on hazards associated with an industrial area and its processes and activities. This includes hazards both inside and near area perimeters. Areas (or appropriate portions of areas) are then presented in their respective IOUs.

IOUs are contained within their respective watersheds identified by the same name (see Appendix I, *Conceptual Site Models and Hazard Tables*, Figures 4.1b to 4.6b Watershed/IOU CSMs). Figure 4.0, *SRS Sitewide Conceptual Site Model*, in Appendix I, provides a high-level (greatest scale) SRS sitewide CSM that shows the relationship between the individual watersheds/IOUs, industrial/process areas, and the eventual receptor of the Savannah River and Savannah River Floodplain

On the next page, Table 4.1, *SRS Hazards, Current Status and End State*, depicts a site summary of SRS hazards, current form, planned end state, and areas where the hazard is located. Also in this chapter, Figures 4.1 to 4.5 pictorially show the disposition path for the

hazards. Appendix I, *Watershed Conceptual Site Models and Hazard Tables*, provides the conceptual site models for each watershed with hazard tables. Appendix J, *Area Conceptual Site Models and Hazard Tables*, provides conceptual site models for each SRS area and hazard tables.

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Table 4.1 SRS Hazards, Current Status and End State

Hazard Class/Category	*Current Status*	*Planned End State*	*Current Form*	*Current Amount*	*Current Area(s)*
Nuclear Materials Class					
Plutonium (Pu)	Plutonium nuclear materials are being stabilized, interim stored if necessary, and dispositioned.	Plutonium will be removed from SRS via Mixed Oxide (MOX) fuel fabrication, processed through the canyon and associated B-Line facility, processed through other future options, or to a federal repository.	See Figure 4.1, *EM-owned Nuclear Materials*	See Figure 4.1, *EM-owned Nuclear Materials*	F, H and K Areas
Uranium (U), Highly Enriched Uranium (HEU) and Depleted Uranium (DU)	Uranium nuclear materials are being stabilized, interim stored if necessary, and dispositioned offsite.	Uranium will be dispositioned offsite via commercial vendors, processed through a canyon, or dispositioned to a federal repository or a commercial disposal site as appropriate.	See Figure 4.1, *EM-owned Nuclear Materials*	See Figure 4.1, *EM-owned Nuclear Materials*	F, H, K, R, and N Areas
Spent Nuclear Fuel (SNF)	All SNF at SRS is consolidated in single storage.	All SNF will be shipped offsite for final disposal at the Yucca Mountain federal repository.	Individual fuel elements	See Figure 4.1, *EM-owned Nuclear Materials*	L Area
Tritium	Ongoing mission to extract new tritium and recycle stockpile tritium.	Ongoing mission to extract new tritium and recycle stockpile tritium.	See Figure 4.5, *Tritium Reprocessing/ Processing*	See Figure 4.5, *Tritium Reprocessing/ Processing*	H-Area

Table 4.1 SRS Hazards, Current Status and End State

Hazard Class/Category	*Current Status*	*Planned End State*	*Current Form*	*Current Amount*	*Current Area(s)*
Radiological Waste Class					
High Level Waste (HLW)	Approximately 37 million gallons (~420 million curies) stored in 49 underground storage tanks. Sludge being removed, treated and fed to the Defense Waste Processing Facility (DWPF) for vitrification; 1700 of 5060 canisters made and stored in the Glass Waste Storage Building. Tailored salt disposition approach to begin October 2005.	All removed HLW will be shipped offsite for final disposal at the Yucca Mountain federal repository.	Sludge, Hard Salt Cake and Liquid Supernate	Sludge – 3 million (M) gallons or 215M curies Hard Salt Cake – 16M gallons or 20M curies Liquid Supernate – 18M gallons or 187M curies	F, H, S, and Z Areas
Transuranic (TRU) Waste	TRU waste is in interim storage and is being shipped off site to the Waste Isolation Pilot Plant (WIPP) for permanent disposal. Over 10,000 drums have been shipped to date.	All SRS TRU waste (and any mixed TRU) will be shipped offsite to the WIPP federal repository for permanent disposal.	See Figure 4.4, *Waste Management*	See Figure 4.4, *Waste Management*	E Area
Low Level Waste (LLW)	All new LLW is disposed in Solid Waste Management Facilities (SWMF).) or sent to a federal or commercial offsite disposal facility.	Low level waste will be disposed on site in accordance with the Atomic Energy Act and Department of Energy (DOE) Order 435.1, *Radioactive Waste Management*, or sent offsite to a federal or commercial offsite disposal facility	See Figure 4.4, *Waste Management*	See Figure 4.4, *Waste Management*	E Area
Mixed Waste (MW) (Low Level Mixed Waste) (LLMW)	Legacy MW is interim-stored onsite until treated in accordance with the Site Treatment Plan schedules. Newly generated MW is typically treated within <12 months per RCRA. All MW is permanently disposed offsite at a commercial disposal facility.	All MW will be permanently disposed off site via commercial vendors or permitted federal facility.	See Figure 4.4, *Waste Management*	See Figure 4.4, *Waste Management*	H, N & E-Area

Table 4.1 SRS Hazards, Current Status and End State

Hazard Class/Category	*Current Status*	*Planned End State*	*Current Form*	*Current Amount*	*Current Area(s)*
Non-Radiological Waste-Class					
Hazardous Waste (HW)	Legacy (pre-LDR) HW is interim stored onsite awaiting treatment/disposal by end of FY06. All newly generated HW is interim stored onsite typically for <12 months per RCRA prior to offsite commercial treatment/disposal.	All HW will be permanently disposed offsite via commercial vendors.	See Figure 4.4, *Waste Management*	See Figure 4.4, *Waste Management*	N-Area
Sanitary	Sanitary Waste is permanently disposed onsite and offsite.	Sanitary waste is permanently disposed onsite and offsite.	Similar to all municipal-type waste and construction and demolition waste from decontamination and decommissioning activities.	SRS generates about 1000 tons per month of municipal-type waste and 3000 tons of Construction and Demolition waste	All areas
Inactive Waste Units Class					
Soil	There are 497 surface units. 310 are remediation complete, 138 are in assessment and 49 are in remediation. A portion of the surface units also have a groundwater component. A portion of the surface units also have a groundwater component.	Cleaned up (remediated) to $10E^{-4}$ to $10E^{-6}$ residual risk per industrial or maintenance exposure scenario consistent with future land use. All waste units will be deleted from the National Priorities List (NPL) either individually or by area with institutional controls in place as needed.	Soil	497surface units - lifecycle	All areas (except Z)
Groundwater	There are 18 groundwater units. 5 are remediation complete, 6 are in assessment and 7 are in remediation.	Groundwater cleanup to Environmental Protection Agency (EPA) Maximum Contaminant Levels (MCLs) will be achieved through treatment,	Groundwater	18 groundwater units --	A, C, D, E, F, G, H,

Table 4.1 SRS Hazards, Current Status and End State

Hazard Class/Category	*Current Status*	*Planned End State*	*Current Form*	*Current Amount*	*Current Area(s)*
		Monitored Natural Attenuation, long term monitoring or combination thereof as needed. All waste units will be deleted from the National Priorities List (NPL) with Institutional Controls in place as needed.		lifecycle	K, L, M, N, P, R, T
EM Facilities Class					
HLW Tanks	There are 51 HLW Tanks at SRS. Two of the 51 HLW Tanks have been operationally closed under SC Industrial Wastewater Closure Plan.	All 51 HLW Tanks will be operationally closed and grouted in place as the final in situ decommissioning	Tanks	51 tanks (2 closed)	F and H Areas
Nuclear, Radiological and Industrial Facilities	There are 1013 EM Facilities (including the 49 "to go" HLW Tanks) totaling 11.4 million square feet. Most are still in use supporting the EM Cleanup Project. Through CY04, 140 facilities had completed decommissioning and 2 HLW tanks have been closed.	All EM Facilities will be permanently decommissioned unless reused to support other long-range federal missions at SRS or designated for historical preservation. 858 facilities are planned to be demolished and 156 are planned for in situ disposal. The EM Deactivation and Decommissioning (D&D) cleanup goal and strategy are to complete D&D in a manner that will not create a new waste unit (that is, a release or potential release of hazardous substances to the environment.)	Buildings and facilities	1013 facilities lifecycle, including 49 HLW tanks	All Areas

Nuclear Materials Disposition Maps

Figures 4.1 through 4.3 describe the planned processes and ultimate disposition for the hazard class of Nuclear Materials at SRS. In many cases, portions of the materials shown in the Sources/Materials Columns are still undergoing characterization to determine if the material is, in fact, suitable for the disposition path shown. In addition, many of the end state dispositions shown in the figures are currently a best projected pathway and will require preparation of, or modifications to existing, National Environmental Policy Act (NEPA) documentation, facility operating licenses, facility authorization bases, etc., in order for the pathways to be realized. For these reasons, figures are subject to change as analyses are performed, options are further evaluated, legal documentation is modified, stakeholder input is obtained, and Department of Energy (DOE) programs are authorized and funded.

Figure 4.4 shows the movement (treatment and disposal) of the various types of wastes at SRS.

The origin of tritium entering the site for recycling or processing; the process or treatment that will be used to prepare it for use or disposition; and its ultimate use or disposition are shown in Figure 4.5, *Tritium Reprocessing and New Processing Material Disposition Map*. Because quantities of tritium are classified information, they are not shown on this diagram.

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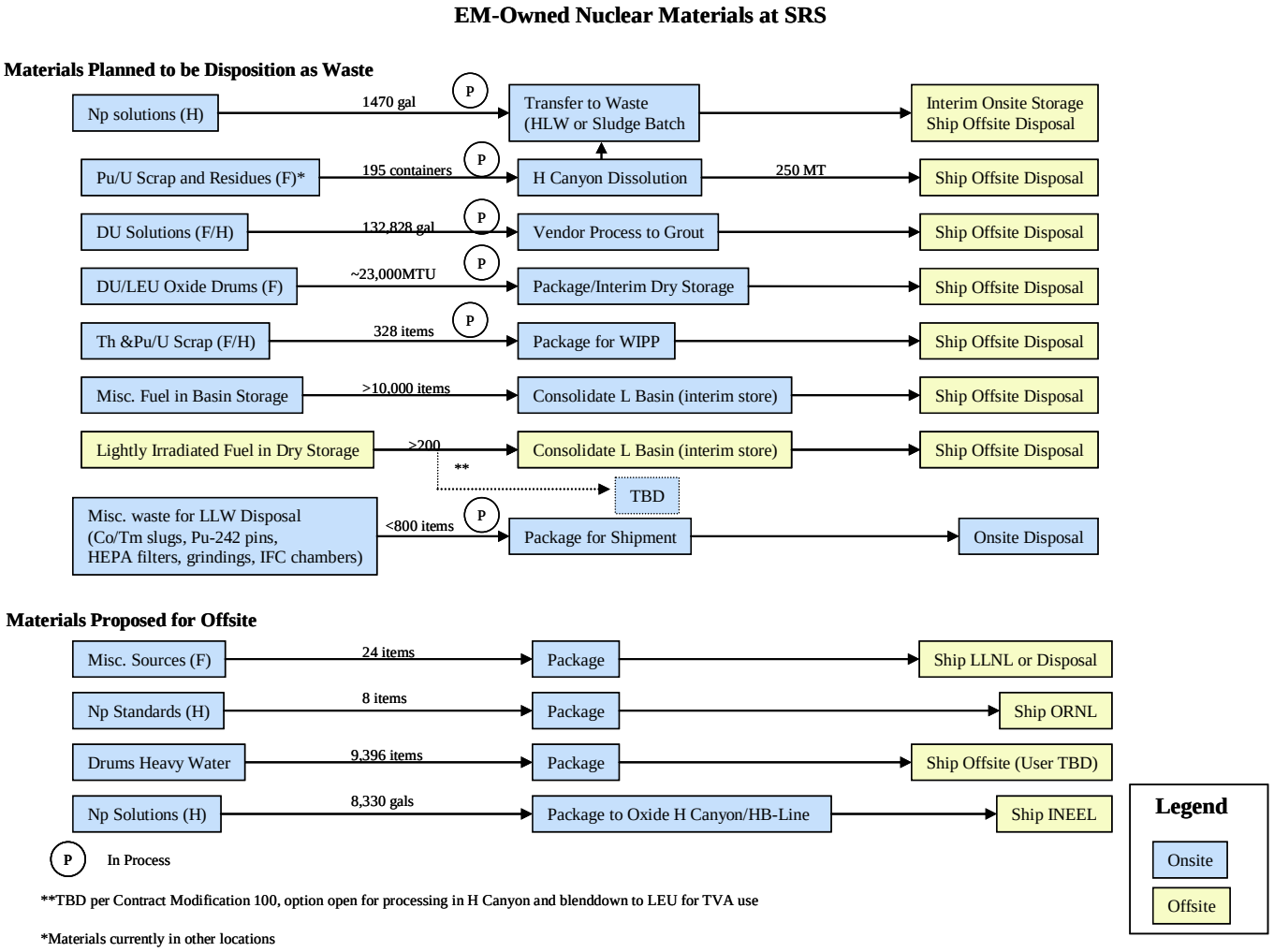

Figure 4.1 EM Owned Nuclear Materials at SRS

EM-Owned Nuclear Materials at SRS (continued)

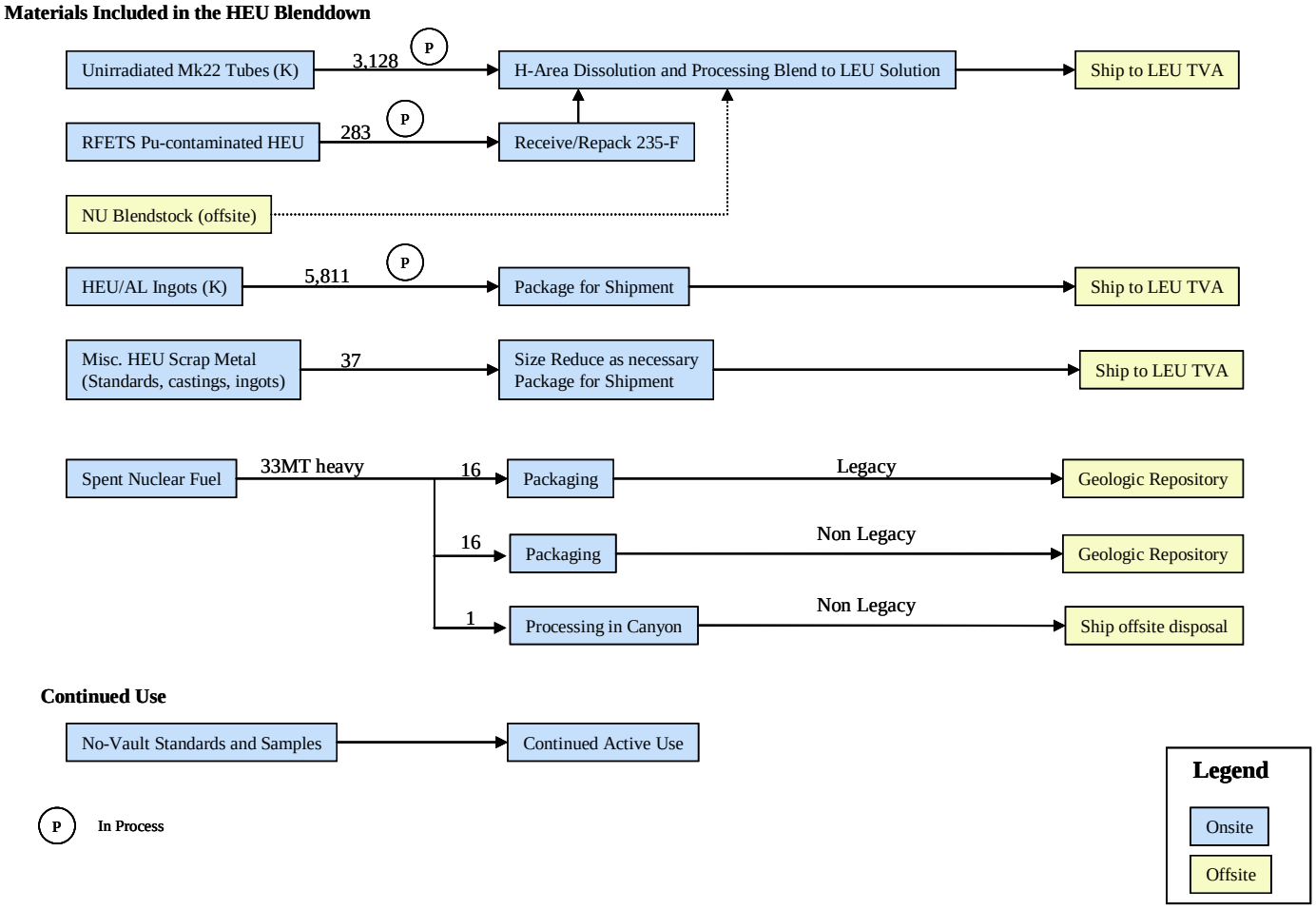

Figure 4.2 EM Owned Nuclear Materials (continued)

EM-Owned Nuclear Materials at SRS (continued)

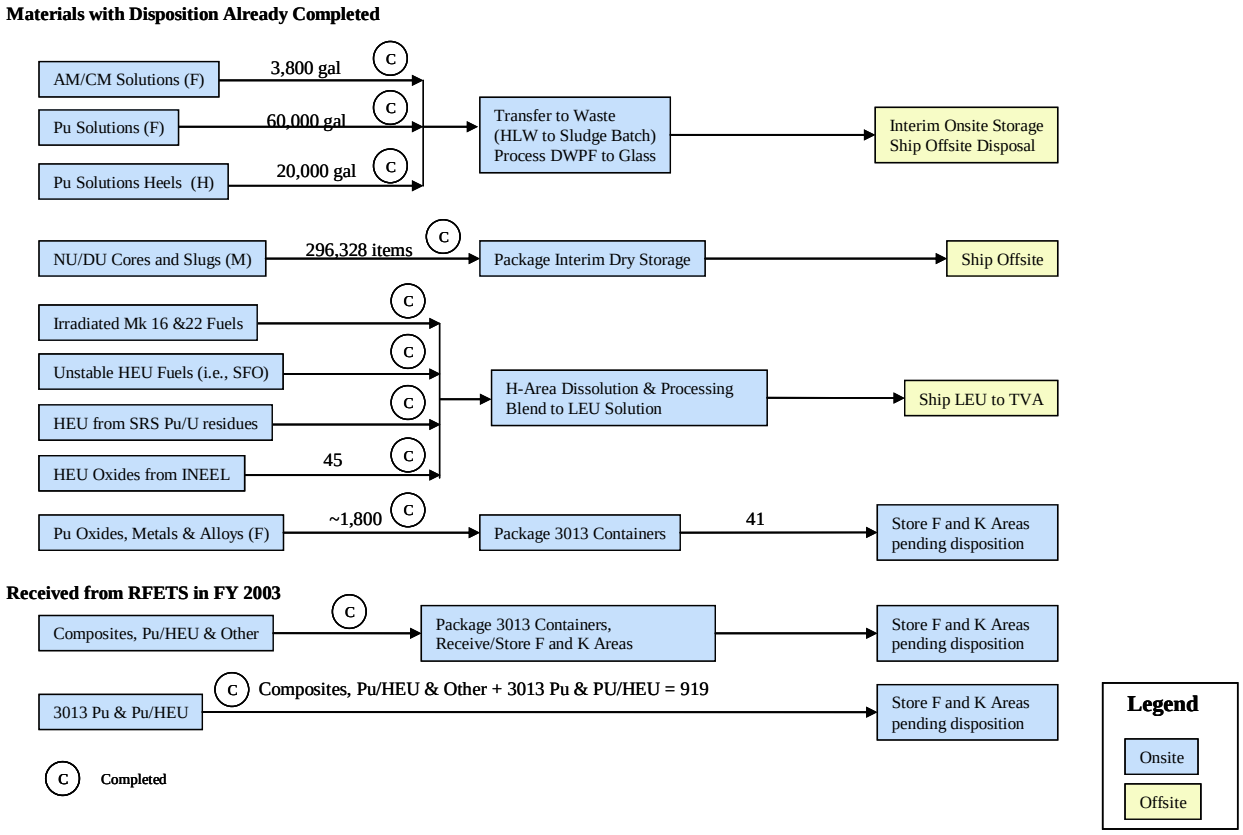

Figure 4.3 EM Owned Nuclear Materials at SRS (continued)

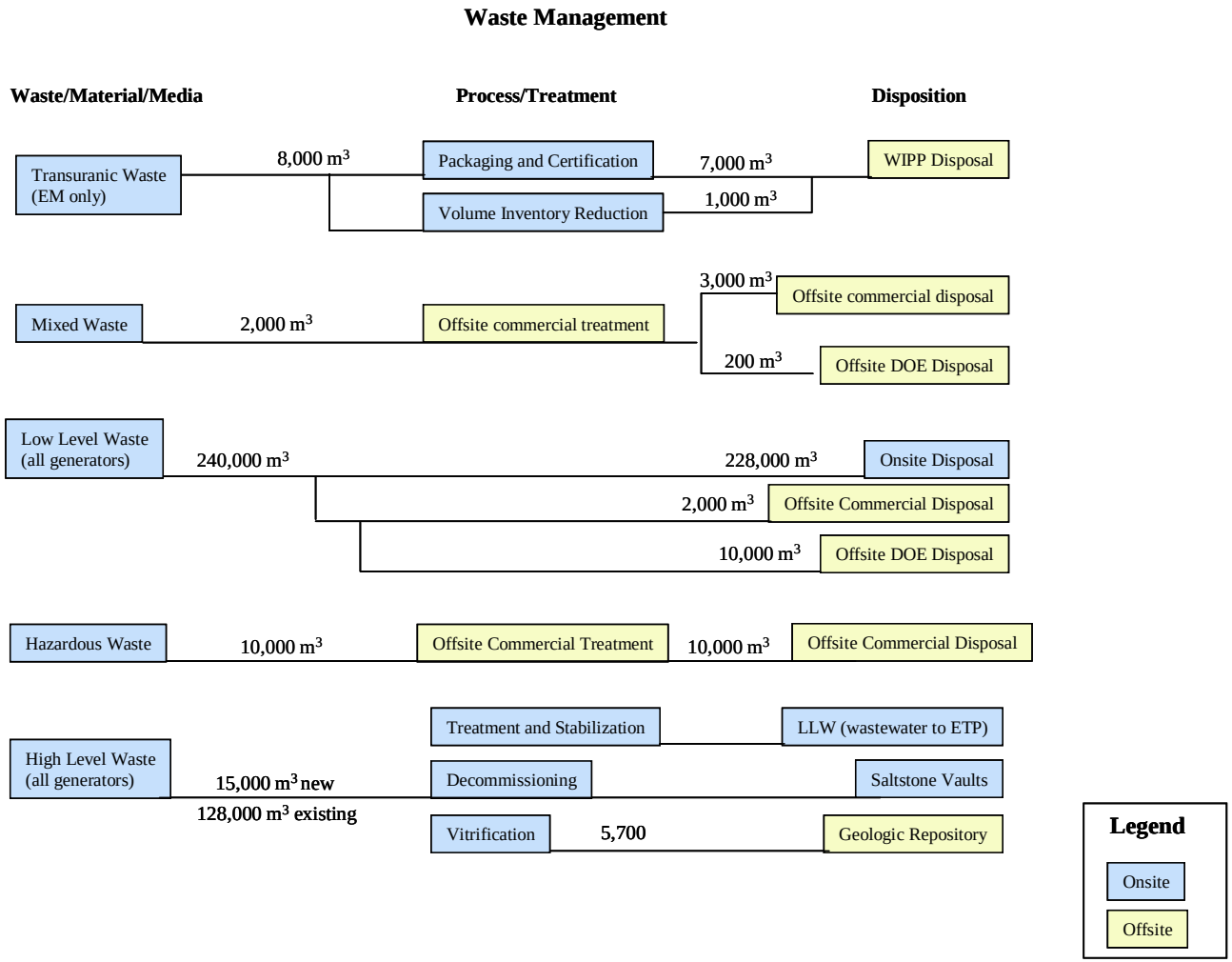

Figure 4.4 Material movements currently in the Waste Management Program

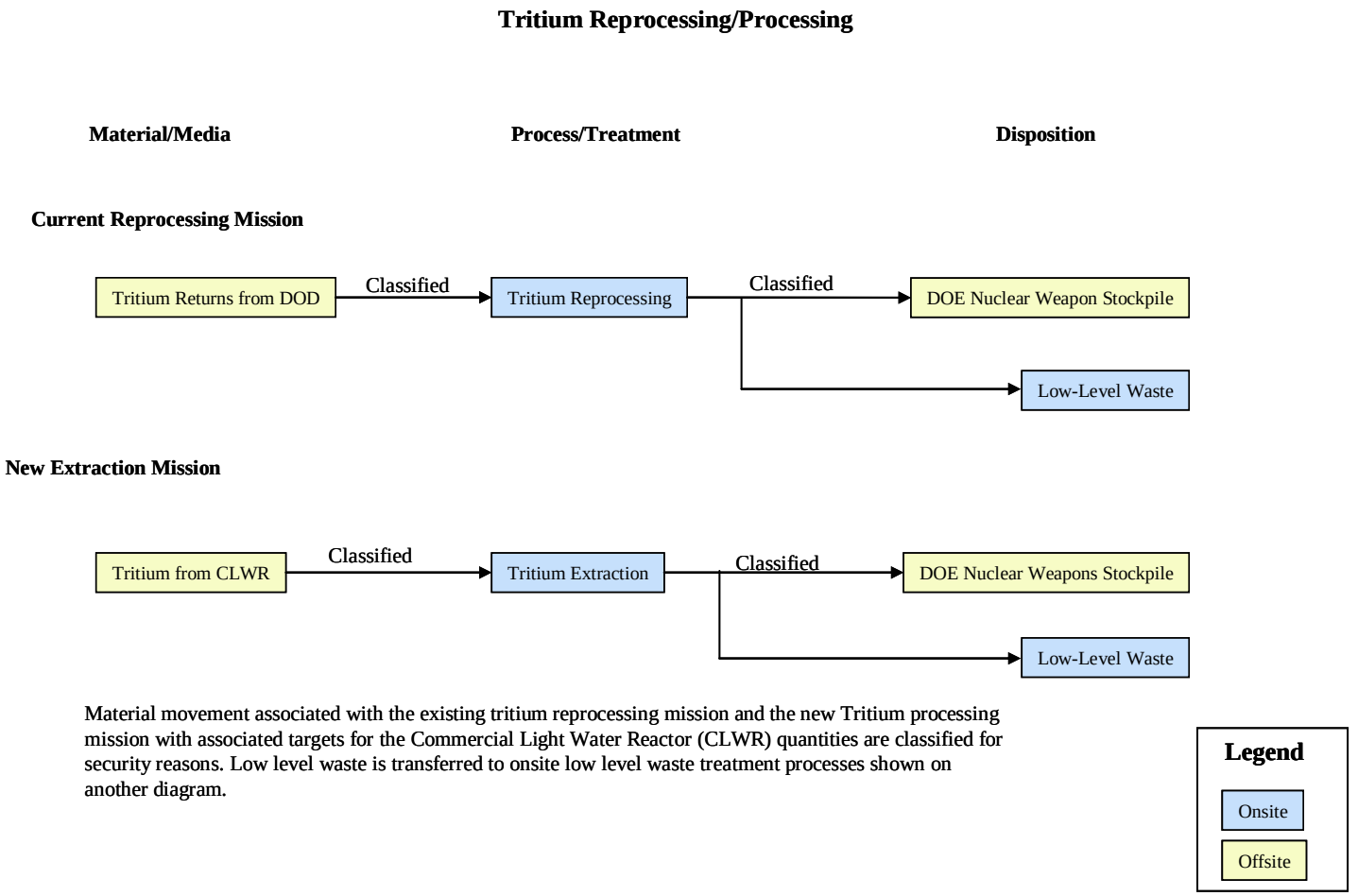

Figure 4.5 Tritium Reprocessing and New Processing Material Disposition Map

4.2 Site Hazards, Risk and Controls for Contained and Released Hazards

Contained Hazards:
Plutonium
Uranium
Spent Nuclear Fuel
Tritium
High Level Waste (HLW)
Transuranic (TRU) waste
Low Level Waste (LLW)
Mixed Waste (MW)
Hazardous Waste
Sanitary Waste
Environmental Management Facilities

Released Hazards:
Soil
Groundwater

The hazard CSMs are designed to communicate the hazard's primary source, release mechanism (potential for contained hazards or actual for released hazards), pathways, exposure route and receptors. For the hazard primary source, the form, amount and facility areas will be noted for the current state and planned end state. For contained hazards, the risk and controls (barriers that contain and avoid a release) are described.

There are numerous and various types of hazards at SRS (reference Table 4.1.) The paragraphs below describe the hazard and discuss the current state, planned end state and final disposition, the risks and controls.

For each hazard, the major facilities associated with managing the hazard are defined and the associated documents (Documented Safety Analysis [DSA], Safety Analysis Report [SAR], Technical Safety Requirement [TSR], Radioactive Waste Management Basis, etc) that answer the question: How does DOE manage and control the hazard to ensure the contained hazard is not released to effect the worker, public or environment?

4.2.1. Hazard: Plutonium (Pu)

Hazard Description and Current Status:

Plutonium nuclear material is a contained hazard at SRS.

Plutonium is primarily a man-made element, produced by irradiating uranium in nuclear reactors. It exists in various forms and grades and is used in nuclear warheads and as fuel in nuclear reactors. The plutonium produced by DOE is held in several forms, including metals, oxides, solutions, residues and scraps. Most DOE plutonium is stored as a metal. Some plutonium forms require treatment and packaging for interim storage until a final disposition path is determined. Plutonium production has ceased in DOE. The excess or surplus plutonium is the hazard that requires storage, treatment and disposition. Because plutonium is highly radioactive, it poses acute dangers to human health and the environment, as well as to national security, unless it is properly stored and safeguarded.

Approximately 34 metric tons of surplus weapon-grade plutonium is planned for disposition by fabricating it into mixed oxide (MOX) fuel for irradiation in existing commercial nuclear reactors. This will convert the surplus plutonium to a form that cannot be readily used to make a nuclear weapon. In addition to the surplus weapon-grade plutonium, approximately 13 metric tons of legacy plutonium do not have a final disposition path and require storage, treatment and disposition.

Plutonium nuclear materials are being stabilized and interim stored, if necessary, and then dispositioned. Plutonium will be removed from SRS via the MOX fuel fabrication process, processed through the HB-Line facility or transferred to a federal repository. For example, most of the plutonium metals or oxides were packaged in certified DOE 3013 containers or

equivalent. The work was completed in FB-Line's Packaging and Stabilization process.

Through Fiscal Year (FY) 2004, a total of 919 containers of plutonium were packaged. The plutonium repackaging program is complete. For information on other plutonium nuclear materials, see Figure 4.1, *EM-owned Nuclear Materials.*

Planned End State (PES)

Plutonium will be removed from SRS via MOX fuel fabrication, processed through the HB-Line facility or transferred to a federal repository. Other processes that could result in a plutonium waste form suitable for disposal at a federal repository are pre-decisional. There will be no excess plutonium nuclear material at SRS at the PES.

Currently, plutonium is repackaged in 3013 containers for interim storage at the K-Area Material Storage Facility Project (KAMS) pending final offsite disposition. During the storage period, periodic surveillance is performed on a cross-section of stored packages. This surveillance will be performed in 235-F until a facility can be installed in 105-K. Plutonium is also dissolved in HB Line and dispositioned as waste via the tank farm.

HB Line, 235-F and KAMS are the primary facilities that ensure safe management of the plutonium hazard until it attains its final end state.

Risk

Because the plutonium was in forms that were not designed for long-term storage, the primary risk was moisture reacting with plutonium causing compounds to form which could compromise the integrity of the storage containers, creating a pathway for contamination to be spread to the workers, public and environment. Near-term risk reduction was driven by the stabilization and packaging of all plutonium to DOE Standard 3013-2004, *Stabilization, Packaging, and Storage of Plutonium-Bearing Materials*. This repackaging activity is complete and thus the primary risk is eliminated.

Controls

The Safety Analysis Report (SAR), Documented Safety Analysis (DSA) and Technical Safety Requirement (TSR) establish the controls (barriers to a release) to contain the hazard and manage the associated risks.

References

K-Area

- *Technical Safety Requirements Savannah River Site, K-Material Storage Facility*, WSRC-TS-96-20, Rev.18, November 21, 2004
- *K-Area Material Storage Facility Documented Safety Analysis*, WSRC-SA-2002-00005 1, Rev 1, June 2004

235-F

- *Safety Analysis – 200 Area Savannah River Site Building 235-F*, WSRC-RP-89-575, Rev.3, January 2003
- *Technical Safety Requirements, Savannah River Site, Building 235-F*, WSRC-TS-97-3, Rev. 7, November 4, 2004
- *Justification for Continued Operations, Savannah River Site, Upgraded Interim Control Posture for Building 235-F*, WSRC-RP-2004-00432, Rev. 0, June 2004
- *Limited Extent Surveillance Modification (Addendum to the 235-F Safety Analysis Report)*, WSRC-RP-89-575, Rev. 0, April 2004

HB-Line

- *HB-Line Safety Analysis Report (U),* Safety Analysis Report; WSRC-SA-2001-00009, Rev. 4, October 2004

- *HB-Line Technical Safety Requirements (U),* Technical Safety Requirements: WSRC-TS-97-7, Rev. 18, October 2004
- *HB-Line Continued Operation with Alternate Hydrogen Control for Phase I Scrap Recovery Processing,* Justification for Continued Operation, WSRC-RP-2002-00615, Rev.2, January 20, 2005

F-Canyon

- *Safety Analysis Report F-Canyon, A-Line, and Outside Facilities,* WSRC-SA-2001-00004, Rev. 3A, September 2004
- *F-Canyon Technical Safety Requirement,* WSRC-TS-97-00015, Rev.1A, September 2004

FB-Line

- *FB-Line Safety Analysis Report, WSRC-SA-2002-00006, Rev. 2B, September 2004*
- *FB-Line Technical Safety Requirements,* WSRC-TS-98-00002, Rev. 3B, September 2004

4.2.2. Hazard: Uranium (Highly Enriched Uranium [HEU] and Depleted Uranium [DU])

Hazard Description and Current Status

Uranium nuclear material is a contained hazard at SRS.

Uranium nuclear materials are being stabilized, interim stored (if necessary), and dispositioned off site. The uranium will be dispositioned off site via commercial vendors, processed through a canyon or dispositioned to a federal repository or commercial disposal site, as appropriate. Enriched uranium will be packaged in certified storage containers, and the work will be accomplished in H Area. Through FY 2004, 793 containers are ready for disposition, out of a lifecycle amount of 2,809 containers.

Plutonium and uranium oxides are residue materials, which will be packaged for disposition in HB Line. Through December 2004, 407 kilograms (kg) have been packaged.

Depleted uranium oxide is being shipped to a commercial disposal facility for permanent disposal. Depleted uranium nitrate solution is being treated by a vendor for disposal at a federal low-level waste disposal facility, and natural uranium is being packaged in a form suitable for disposition. The work is being performed in F and M Areas. Depleted and natural uranium metal previously stored in M Area was disposed at a commercial facility in FY 2003. Through December 2004, 6,139 metric tons (MT) have been packaged shipped for disposal out of a lifecycle amount of 23,182.

L Basin, K Area and H Canyon are the primary facilities that ensure safe management of the Highly Enriched Uranium (HEU) hazard until it attains its final end state. F Area is the primary area that ensures safe management of the depleted uranium (DU) hazard until it attains its final end state.

For information on other uranium nuclear materials, see Figure 4.1, *EM-owned Nuclear Materials.*

Planned End State (PES)

All uranium will be removed from SRS by means as described above. No residual materials inventories will remain.

Risk

The primary risk from HEU is from exposure (worker) to the liquid form of the material. The risk is being reduced through blending to low enriched uranium and shipment off site to be reused in the commercial power generating industry. Current planning (FY 2005) has all of this material dispositioned by FY 2008, thus eliminating the risk.

The primary risk from DU nitrate solutions is from exposure (worker) to the liquid form of the material and its hazardous constituents. As the material is shipped offsite for treatment, the risk is reduced. Current planning (FY 2005) is for all of this material to be treated and dispositioned in FY 2005, thus eliminating the risk.

The primary risk from DU oxide is associated with the form (very low risk) and quantity of the material. As the material is shipped offsite, the remaining risk is reduced.

Controls

The SAR, DSA and TSR establish the controls (barriers to a release) to contain the hazard and manage the associated risks.

References

HB-Line

- *HB-Line Safety Analysis Report (U),* Safety Analysis Report; WSRC-SA-2001-00009, Rev. 4, October 2004
- *HB-Line Technical Safety Requirements (U),* Technical Safety Requirements, WSRC-TS-97-7, Rev. 18, October 2004
- *HB-Line Continued Operation with Alternate Hydrogen Control for Phase I Scrap Recovery Processing*, Justification for Continued Operation, WSRC-RP-2002-00615, Rev.2, January 20, 2005

H-Canyon

- *H-Canyon Safety Analysis Report (U),* WSRC-SA-2001-00008, Rev. 5, February 2004
- *H-Canyon and Outside Facilities Technical Safety Requirements (U),* WSRC-TS-96-19, Rev. 9, February 2004
- *Use of Gadolinium as a Neutron Poison for Pu Solutions in H-Canyon (U),* JCO, (Justification for Continued Operation) WSRC-RP-2002-00632, Rev. 0, December 2002
- *Processing Pu Contaminated Scrap in H-Canyon (U),* JCO, WSRC-RP-2004-00283, Rev. 0, September 2004

F-Canyon

- *Safety Analysis Report F-Canyon, A-Line, and Outside Facilities,* WSRC-SA-2001-00004, Rev. 3A, September 2004
- *F-Canyon Technical Safety Requirement,* WSRC-TS-97-00015, Rev.1A, September 2004

FB-Line

- *FB-Line Safety Analysis Report, WSRC-SA-2002-00006, Rev. 2B, September 2004*
- *FB-Line Technical Safety Requirements,* WSRC-TS-98-00002, Rev. 3B, September 2004

4.2.3. Hazard: Spent Nuclear Fuel

Hazard Description and Current Status

Spent nuclear fuel (SNF) is a contained hazard at SRS.

Spent nuclear fuel is heavy mass metal which is being prepared for final disposition. The work is now being performed in L-Area Reactor Disassembly Basin. Through FY 2004, 2.822 metric tons of heavy metal (MTHM) have been prepared out of a lifecycle amount of 36 MTHM.

L Basin and H Canyon are the primary facilities that ensure safe management of the spent nuclear fuel hazard until it attains its final end state. SNF will remain in wet storage until a packaging capability prepares it for disposition at the Yucca Mountain Federal Repository. Shipments are anticipated to complete in 2020.

Planned End State (PES)

All SNF will be shipped offsite for final disposal at the Yucca Mountain Federal Repository. There are no residual hazards planned after the end state.

Risk

Spent nuclear fuel is radioactive and contains fission products from irradiation. The fuel is stored underwater to provide shielding for workers. The water within the basin is continuously filtered and controlled chemically to minimize any corrosion or degradation of the fuel.

Controls

Potential spent fuel receipts are analyzed for safety/criticality before shipment is authorized. Once received, fuel and basin operating conditions are monitored under specific controls.

References

- *L-Area Material Storage Facility Documented Safety Analysis*, WSRC-SA-2004-00002, Rev. 0, June 2004
- *Technical Safety Requirements Savannah River Site, L-Material Storage Facility*, S-TSR-L-00002, Rev. 0, October 2004
- *Nuclear Criticality Safety Evaluation: Double Contingency Analysis for the L Disassembly Basin*, N-NCS-L-00018, Rev. 0, December 2002.

4.2.4. Hazard: Tritium

Hazard Description and Current Status

Tritium is a contained hazard at SRS.

Tritium is a radioactive form of hydrogen. An atom of normal hydrogen has one negative particle, called an electron, and one positive particle, called a proton. An atom of tritium has two additional neutral particles, called neutrons. The neutrons make the tritium atom unstable and cause it to emit a very low-energy form of beta radiation.

Like normal hydrogen, tritium can bond with oxygen to form water. When this happens, the resulting water (called tritium oxide or tritiated water) is also radioactive. Because tritium oxide is chemically identical to normal water, it cannot be filtered out of water.

Tritium is processed in H Area. Tritium gas is purified and contained in tanks or solid storage beds. Small quantities of tritium oxide are also stored, pending conversion to tritium gas. Specific quantities and locations of tritium are classified.

The tritium purification process is designed to maintain tritium in the elemental form. There are systems that collect tritium oxide and convert it to the elemental form. However, a certain amount of the tritium forms compounds other than water and may include tritium in organic molecules, such as oils or polymers, and tritium that forms hydrides of several metallic species as part of the tritium storage technology used in the facilities. The varying chemical properties of these compounds affect the biological behavior, and, therefore, the rate of exposure to persons who are exposed to these materials. A significant portion of these materials are in storage beds that will be sealed and transported to the site's solid waste facility as low level waste; however, it is expected that there will be a low level of residual material that must have the appropriate radiological controls to prevent personnel exposure.

Tritium also permeates the structural materials making up the primary containments and, in some cases, secondary containments in various facilities. This tritium may emanate ("outgas") from these materials over a period of years. The time required for outgassing to reach equilibrium with the environment varies based on the material. Concrete that has been exposed to high levels of tritium may contain significant levels of tritium after several decades. Metals such as stainless steel that have been used as process piping or primary containment may

contain significant levels of tritium for even longer periods.

The Tritium Mission is an ongoing National Nuclear Security Administration (NNSA) mission to extract new tritium and recycle stockpile tritium. See Figure 4.5, *Tritium Reprocessing/Processing* for more information.

Reference the *NNSA-Savannah River Operations Office (SRSO) Ten-Year Comprehensive Site Plan FY 2005* for additional information.

Planned End State (PES)

Tritium will continue to be a contained and managed hazard at SRS. The projected need for tritium reservoirs for nuclear defense continues beyond the timeline in the *SRS End State Vision*.

Risk

Any possible adverse health effects from tritium are the result of the beta radiation it emits. Because tritium's radiation cannot penetrate the skin, the only real exposure a person receives is the radiation received while tritium is inside the body.

Exposure time – and thus the possibility of health effects – depends on the form of tritium present: elemental tritium gas, tritium oxide, or particulates. While people can inhale tritium gas, only about 0.004 percent is retained more than a minute or so, so it is an insignificant exposure hazard.

Tritium oxide can enter the body in various ways. It can be inhaled as water vapor, absorbed by the skin, or ingested. Regardless of the way it enters the body, tritium oxide immediately mixes with the body fluids and is eliminated like normal water. The rate of elimination naturally varies from person to person. In general, however, half of the tritiated water is eliminated in 10 days. This can be sped up by drinking larger quantities of liquids.

Tritium in the food chain follows the same pattern. Tritiated water goes through an animal's body and is eliminated with the other fluids, rather than settling in the animal's body. Depending on the size of the animal, this time can be days, hours or minutes.

Tritium that has contaminated groundwater at SRS poses a risk if the groundwater is ingested or inhaled, as described above.

Controls

Tritium processing equipment uses technology advances to improve safety, health and environmental protection. These advances include secondary confinement of tritium processing systems in gloveboxes, and glovebox cleanup systems to minimize tritium releases to the environment. Metal hydride beds are used for tritium storage in a safe solid form. Dry pump systems eliminate the use of oils and mercury that may generate hazardous or mixed wastes.

Getter bed technologies replaced the previous oxidation-absorption technology of stripping small amounts of tritium from gas streams. Getters are designed to remove tritium and other elemental hydrogen isotopes from the gas stream onto a metallic material such as a metal hydride.

Process piping is the primary containment for tritium facilities.

The SAR, DSA and TSR establish the controls (barriers to a release) to contain the hazard and manage the associated risks.

SRS institutional land use controls prevent the use of groundwater as a source of water for drinking or showering. Thus, those exposure routes (ingestion, inhalation) for tritium-contaminated groundwater are prevented.

References

- *Tritium Safety Analysis Report,* WSRC-SA-1-2, October 2003
- *Tritium Facilities Technical Safety Requirements,* WSRC-TS-96-17, October 2003

4.2.5. Hazard: High Level Waste

Hazard Description and Current Status

High Level Waste (HLW) is a contained hazard at SRS.

This waste exists as sludge, salt cake and salt supernate stored in 51 underground tanks located in H and F area tank farms. One of these tanks has not received any High Level Waste and two tanks have been closed. Of the approximately 36 million gallons of HLW currently in storage, 3 million gallons is sludge, 16 million gallons is in the form of salt cake and 17 million gallons is in liquid supernate form.

Currently the sludge is being removed from selected tanks, washed and fed to the Defense Waste Processing Facility (DWPF) for vitrification. DWPF has processed 1700 canisters of the estimated 5060 canisters for the life-cycle disposition of HLW. The canisters are stored in the first glass waste storage building, awaiting shipment to the federal repository when it opens. A second glass waste storage building is under construction and will be available in June 2006. Shipments to the federal repository are expected to begin in FY 2010.

Over 100 million gallons of waste liquids have been received into the HLW System since the 1950s. The waste is neutralized with caustic, precipitating metals. The waste is allowed to settle, forming a sludge. Supernate is concentrated by evaporation, forming saltcake.

The highest risk onsite is the sludge waste, which is stored in liquid form in 48 of the remaining 49 underground storage tanks. One tank (Tank 50) has not received any HLW. Sludge waste is 8% of the volume with 3 million gallons and 50% of the radioactivity with 215 million curies. The salt waste is 92% of the volume with 34 million gallons and 50% of the radioactivity with 207 million curies. The primary radioactive waste component is cesium. The salt waste is in two forms: hard salt cake and liquid supernate. The 16 million gallons of hard salt cake has 43% of the volume and only 5% of the radioactivity with 20 million curies. The 17 million gallons of liquid supernate is 40% of the volume and has 45% of the radioactivity with 187 million curies.

HLW was stored in 50 underground tanks in F and H Areas. Two of the 51 tanks have been emptied and operationally closed under the South Carolina Department of Environmental Control (SC DHEC) regulatory authority and three more are empty. One tank has not received any HLW. Each tank can hold approximately one million gallons. Twenty-seven of the tanks meet secondary containment standards, with double walls and no leakage history. Twenty-four tanks are considered “higher risk” as they are 50 years old, single-walled, and most have some history of leakage. However, none is currently leaking.

Planned End State (PES)

The end state for the insoluble sludge is for the sludge to be washed and converted into borosilicate glass in DWPF in S Area. This glass is stored in canisters, which will be shipped offsite to the federal repository, when available. Currently these filled canisters are being stored in the Glass Waste Storage Building in S Area.

A complete discussion of the DWPF and Glass Waste Storage Building end state can be found in the *Defense Waste Processing Facility Final Environmental Impact Statement, DOE/EIS-0082* and the *Defense Waste Processing Facility Final*

Supplemental Environmental Impact Statement, DOE/EIS-0082-S.

The soluble waste (supernate and dissolved saltcake) will be processed by the Salt Waste Processing Facility (SWPF). After waste is removed, the tanks will be closed by grouting them in place. No salt waste will be disposed until the SWPF is ready for startup, scheduled for FY 2010.

A complete discussion of the HLW Tank closure end state can be found in the *High Level Tank Closure Final Environmental Impact Statement, DOE/EIS-0303*

Plans are to operate both the DWPF and SWPF until 2019, and canister shipments to the federal repository are planned to be completed in FY 2024.

To accelerate risk reduction, the site is planning a tailored salt treatment. These plans include removing some of the cesium by draining the liquid from the lower-curie salt and low-curie/high actinide salt and placing the removed liquid with the high-curie/high actinide salt for later processing. Once the cesium is removed, the low-curie/high actinide salt will be processed in the Actinide Removal Facility and sent with the low-curie salt to the Saltstone Facility to be formed into grout in Z Area. The high-curie/high actinide salt will be sent to the SWPF. From there, the cesium and actinides will be sent to DWPF and the decontaminated salt solution will be sent to the Saltstone Facility.

At the Saltstone Facility, the aqueous waste is mixed with flyash, slag, and cement and poured into concrete vaults to solidify. The Saltstone Disposal Facility, also located in Z Area, is an engineered disposal facility with low water permeability and non-leaching qualities. The final product is non-hazardous, meeting Nuclear Regulatory Commission (NRC) Class C limits, and the groundwater is protected to drinking water standards.

A complete discussion of the Salt Disposal Facility and SWPF end states can be found in the *Environmental Impact Statement on Salt Processing Alternatives, DOE/EIS-0082-S2D.*

Risk

There is a risk at SRS with the interim storage of high level waste. The major threat is from radioisotopes migrating from the HLW in a leaking tank to the groundwater. The environmental hazard associated with storing liquid radioactive waste in 50-year old underground carbon steel tanks is reduced by over 99.9% by removal of the waste in the storage tanks and vitrification of this waste in DWPF. The robust waste form created (solid glass matrix inside a welded stainless steel canister) is suitable for indefinite long term storage with extremely low potential for any adverse environmental impact.

Controls

Full project management controls are applied to the disposition of HLW. Included in the control activities is an integrated plan encompassing all the HLW facilities and their interrelated flow paths. Waste management activities for monitoring, moving and processing the HLW in the underground tanks are under a disciplined safety basis with associated controlled documents. Procedures are in place to transfer liquid from any tank and annulus to another tank if a leak occurs.

References

- *High Level Waste System Plan*, Rev.13. HLW02002-00025
- *PMP Supplement to the High Level System Plan*, Rev.13, HLW-2002-00161

- *Defense Waste Processing Facility Final Environmental Impact Statement,* DOE/EIS-0082
- *Defense Waste Processing Facility Final Supplemental Environmental Impact Statement,* DOE/EIS-0082-S
- *SRS Federal Facilities Agreement* (Section IX for High Level Waste)
- *Defense Waste Processing Facility Safety Analysis Report,* WSRC-SA-6, Rev.17
- *Defense Waste Processing Facility Glass Production Control Program,* WSRC-IM-91-116-6, Rev. 2
- *Environmental Impact Statement on Salt Processing Alternatives, DOE/EIS-0082-S2D*
- *High Level Waste Tank Closure Final Environmental Impact Statement,* DOE/EIS-0303, May 2002
- *Closure Plan and Performance Assessment for F- and H-Area High Level Waste Tank Systems – Preliminary Draft,* Revision 2, August 14, 2000
- *Industrial Wastewater Closure Plan for F- and H-Area High Level Waste Tank System,* WSRC-2003-00498, August 16, 2004
- *Emergency Preparedness Hazard Assessment for the Concentration, Storage and Transfer Facilities,* S-EHA-G-00002, Rev 6, April 2004

4.2.6. Hazard: Transuranic (TRU) Waste

Hazard Description and Current Status

Transuranic (TRU) waste is a contained hazard at SRS.

This waste is stored at SRS on above ground storage pads (covered and uncovered). TRU waste is containerized on the storage pads in 55-gallon drums, standard waste boxes, concrete culverts, large steel boxes and other miscellaneous size containers. A small portion of TRU waste is stored on a concrete pad and covered with three feet of soil.

At the beginning of calendar year 2005, SRS's volume of stored TRU waste was approximately 8,000 cubic meters, consisting of 15,000 fifty-five-gallon TRU waste drums and 3,000 large containerized boxes. SRS is shipping the waste to the Waste Isolation Pilot Plant (WIPP) at an average rate in excess of a 1,000 cubic meters per year with the plans to complete the shipments of currently stored TRU waste by 2010.

TRU waste is primarily waste contaminated with plutonium-238 and plutonium-239 transuranic nuclides that has been generated at SRS over the past 30 years as a result of the radiochemical separations processes, analytical process control laboratories, and laboratory research activities. In addition, a small quantity of TRU waste at SRS came from offsite facilities. The waste is primarily debris waste (in a solid form) including job control waste such as equipment, piping, and glove boxes.

The plutonium-238 TRU waste presents a repackaging challenge due to contamination control, heat generation, and prevention of worker exposure. This waste is highly dispersible and is approximately 500 times more difficult to contain than plutonium-239. The heat generation and alpha emissions degrade the organics. It is also approximately 280 times more radioactive than plutonium-239. Due to the high worker risk associated with excavation and repackaging the plutonium-238 contaminated TRU waste, the SRS end state vision includes an evaluation of an alternative end state (See Appendix B, *Alternative End States and Recommendations*).

Planned End State (PES)

All SRS TRU waste (and any mixed TRU) will be packaged and shipped off site to the WIPP, federal repository for permanent disposal.

This is required by, and consistent with, the Land Withdrawal Act, Public Law 102-579, the guiding legislation for WIPP.

Risk

The risk of TRU waste is the waste inside the containers escaping and/or breaching their containers and coming in contact with the site workers and the environment. The risks include the unlikely event of the waste inside the drums catching fire and creating a cloud of smoke containing plutonium-238 and plutonium-239 particulates that travel in the area and spread to other areas of the site. There is little risk to an offsite individual and the public.

The risks of storing and handling TRU waste is contained and managed by a combination of 1) requiring workers who handle TRU waste to be trained, 2) requiring operating procedures to be used to handle and store waste, and 3) requiring engineered and safety controls to be in place.

Controls

Some examples to control and contain the risk include limiting the number of TRU waste containers that can be stored on a pad. The site requires TRU waste with higher activity of plutonium-238 and plutonium-239 to be placed in robust concrete converts. Other requirements are to limit personnel and vehicles on TRU waste storage pads and to conduct routine inspections on the TRU waste containers for signs of container integrity and improper storage of the waste.

These controls are established through engineering and safety evaluations and preparation of documents and calculations.

Some key documents include the SAR, DSA, and TSR. The above documents are used to establish the controls to contain the hazard and manage the associated risks.

References

The following are applicable for TRU, LLW, Mixed LLW and Hazardous Waste. TRU waste is the bounding hazard.

- *Solid Waste Management Facility Safety Analysis Report*, WSRC-SA-22 Rev. 4, May 2003
- *Solid Waste Management Facility Safety Technical Safety Requirements*, WSRC-TS-95-16, Rev. 5, July 2004
- *SRS Waste Acceptance Criteria Manual*, WSRC-1S (for all solid waste types) establishes all waste acceptance criteria storage limits, storage containers requirements.
- *Radiological Performance Assessment for the E Area Low Level Waste Facility*, WSRC-RP-94-218 established radio-nuclide limits for LLW onsite disposal
- *Radioactive Waste Management Basis* (RWMB) establishes the requirements for handling and storage of any radioactive waste. RWMB is specific for each facility

4.2.7. Hazard: Low Level Waste

Low-level waste (LLW) waste is a contained hazard at SRS.

Low-level waste (LLW) waste is radioactive waste that is not classified as high-level waste, transuranic waste, mixed waste, spent fuel or by-product material. It usually contains small amounts of radioactive waste dispersed in large quantities of material. Typical low-level waste consists of used protective clothing, rags, tools and equipment, used resins and residues, dirt, concrete, construction debris and scrap metal. LLW does not contain Resource Conservation and Recovery Act (RCRA)-regulated hazardous waste.

Solid Low Level Waste

Hazard Description and Current Status

Solid LLW consists of job control waste (contaminated tools, rags, clothing, etc), rubble from destruction of buildings, contaminated equipment (tanks, valves, air duct, etc.) and Naval Reactor components from nuclear submarines. The site has generated approximately 25,000 cubic meters (m3) of solid LLW per year since 2004.

SRS has reduced the amount of legacy solid LLW from over 3,000 m3 at the end of FY 2002 to its current state of only 23 m3. The remaining legacy waste will be disposed of by the end of FY 2005. At that time, the site will actively dispose of solid LLW as it is being generated.

Solid LLW is first sorted, segregated (separated by type and amount of radioactivity), and, in some cases, volume reduced. It is then packaged and disposed of according to its nature and characterization. Selection of the appropriate treatment option and/or disposal facility is based on the waste characterization and form. Solid LLW is disposed on site using four different options: the Low Activity Waste Vaults (LAWV), the Intermediate Level Vaults (ILV), Engineered Trenches or the "slit" trenches. Solid LLW is also shipped offsite to a federal or commercial disposal facility depending on the radionuclide content and quantity.

In the past, solid low-level waste was disposed of in the Low-Level Radioactive Waste Disposal Facility (LLRWDF, previously called the Low-Level Burial Grounds). The LLRWDF was closed (capped) under RCRA in 1999, and no longer accepts waste for disposal. However, SRS will continue monitoring the groundwater beneath the LLRWDF to detect any radioactivity that might migrate from the disposal facility.

SRS uses engineered concrete vaults for the permanent disposal of solid LLW. Radionuclides that require a better isolation from the environment are placed in these vaults. These vaults are located in the E-Area Low Level Waste Facility (LLWF).

SRS disposes solid LLW with extremely low radioactive content in Engineered Trenches and in slit trenches. The Engineered Trenches measure 650 feet in length by 150 feet wide and are utilized primarily for containerized waste. The trenches are equipped with a sump and pump system (including sample station) to manage anticipated rainfall. The trenches are also equipped with a vadose zone monitoring system (VZMS) installed around the perimeter.

The slit trenches are approximately 20 feet wide by 600 feet long. These trenches are also used for very low activity waste primarily from the destruction of onsite buildings (concrete rubble). The slit trenches are also equipped with vadose zone monitoring systems.

SRS uses another method for disposal of equipment that is physically too large for vault disposal and contaminated at high enough levels to require vault type isolation. The technique, called "components-in-grout," consists of placing the item on a one-foot thick grout base, filling any void space with special formulation grout, and grouting around the item using the trench walls as a form. This technique allows for the disposal of large legacy equipment that is classified as solid LLW, as well as any newly-generated waste, without having to build new vaults.

Planned End State (PES)

Solid LLW that is disposed of at SRS will be a residual hazard. However, the closure of the facility will include a multi-layered cap that will reduce the infiltration of rainwater and the mobility of the radionuclides to the aquifer. The facility will be monitored closely for compliance to groundwater standards and will remain

protected from general public intrusions. If noncompliances are discovered, remediation of the site would be implemented.

The Atomic Energy Act authorizes DOE to manage LLW. This planned end state meets the performance requirements of DOE Order 435.1, *Radioactive Waste Management*, ensuring protectiveness of human health and the environment.

Risk

The solid LLW currently being disposed of at SRS contains various radionuclides. This waste will eventually decompose and release the radionuclides into the environment. Some of the radionuclides have short half-lives and will not be a risk because of this natural attenuation. The other radionuclides are managed (amounts are limited) to ensure they do not exceed specific requirements identified in DOE Orders and/or state regulations that are protective of human health and the environment. Groundwater and intruder modeling of the waste has been performed and is continuously evaluated to ensure the public and the environment are protected. To ensure the modeling is conservative, groundwater and vadose zone monitoring are performed and evaluated at least annually.

Controls

Waste acceptance criteria (WAC) are established for each disposal facility (vaults and trenches). It establishes the quantity of radionuclides allowed for a package to ensure the public and environment are protected. These WACs are based upon the Performance Assessment modeling of groundwater and intruders.

References

- *Manual 1S, SRS Waste Acceptance Criteria Manual*, Revision 9, January 14, 2005
- *Radiological Performance Assessment for the E-Area Low-Level Waste Facility*, WSRC-RP-94-218, Revision 1, January 31, 2000

Liquid low-level waste

Hazard Description and Current Status

Liquid LLW is a contained hazard at SRS.

Liquid low-level waste is a by-product of the separations process and tank farm operations. This waste is treated on site by several methods, depending upon its nature.

The Effluent Treatment Project (ETP) collects and processes low-level radioactive and chemically contaminated wastewater from both the High-Level Waste Tank Farm Evaporator overheads and from reprocessing facility evaporators. ETP treats liquid low level waste for discharge to a National Pollutant Discharge Elimination System (NPDES) permitted outfall, effectively capturing all chemical and radioactive contaminants except tritium. The state-of-the-art process at ETP includes pH adjustment, submicron filtration, organic removal, reverse osmosis and ion exchange. ETP replaced the seepage basins that were used until November 1988.

Concentrated liquid waste from the ETP evaporators is further treated at the SRS Saltstone Facility. At this facility, the waste stream undergoes a cement grout immobilization process, after which the waste form is classified as low level waste.

After the waste is received at Saltstone, the liquid salt solution is mixed with cement, fly ash and furnace slag to form a grout. The resulting grout is disposed by pumping it to engineered concrete vaults. Here, it cures into stable concrete (called “saltstone,” hence the name of the facility). After filling, the vault is capped with clean concrete to isolate it from rain and

weathering. Final closure of the area consists of covering the vaults with a clay cap and backfilling with earth. Extensive testing shows that any waste constituents leached from the saltstone will remain within Environmental Protection Agency drinking water standards. Wells near the edge of the disposal site are used to monitor groundwater to ensure that it meets standards established by the South Carolina Department of Health and Environmental Control.

Construction of the Saltstone Facility and the first two vaults were completed in July 1988. The main process waste stream that Saltstone was designed to process is the high-volume, low-activity waste stream from the HLW pre-treatment process. The Saltstone facility has been in suspension since 1999 because of the decision to seek an alternative process to prepare high-level waste solutions for DWPF and Saltstone. Suspension of the facility reduces costs while minimizing potential deterioration of the plant. This action helps support future operations of the plant and minimizes the cost to restart the facility in the future.

The Effluent Treatment Project (ETP) has water treatment chemicals that are stored in diked 10,000-gallon tanks. These tanks contain sodium hydroxide or nitric acid. In addition there are other small amounts of oxalic acid and aluminum nitrate stored in chemical storage areas for further water treatment.

Currently the ETP treats between 10 and 25 million gallons of wastewater per year.

Planned End State (PES)

The ETP will be decommissioned consistent with the other excess EM facilities, and consistent with the closure of the H-Area.

Risk

Residues upon closure will be removed and neutralized as needed.

Controls

WAC is established for the ETP and establishes the type and quantity of radionuclides and chemicals allowed into the facility for treatment to ensure the public and environment are protected. These WACs are based upon the Performance Assessment modeling of groundwater and intruders as well as discharge permits granted to the ETP by the State of South Carolina.

References

- *F/H Tank Farms Waste Compliance Plan for Transfers to the Effluent Treatment Facilities*, WSRC-TR-99-00009, latest revision as amended
- *LWD/WS Projects Safety Basis Manual*, WSRC-IM-94-10, dated January 6, 2005
- *Emergency Preparedness Hazard Assessment for the Consolidated Incinerator Facility, Effluent Treatment Facility, and Saltstone Facility*, S-EHA-G-0004, Rev. 3, Dated September 2003..

4.2.8. Hazard: Mixed Waste

Hazard Description and Current Status

Mixed Low-Level Waste is a contained hazard at SRS.

Mixed Low-level waste (MLLW) is a low-level waste (LLW) as defined in Section 4.2.7, *Low Level Waste* in this chapter, which also contains a hazardous component subject to the Resource Conservation and Recovery Act (RCRA) or the Toxic Substances Control Act (TSCA). Therefore, MLLW is managed in accordance with the requirements of RCRA, TSCA and

DOE Order 435.1, *Radioactive Waste Management*.

Early site practices dispositioned some MLLW in an onsite facility referred to as the Mixed Waste Management Facility. This facility, located in E Area, was closed in 1990 under RCRA requirements and is now under post-closure care. Presently, new MLLW is stored onsite for less than one year per RCRA and is permanently disposed offsite via commercial vendors. MLLW is stored in RCRA-permitted facilities at the E-Area Solid Waste Management Facility, H-Area Solvent Storage Tanks, and the N-Area Hazardous/Mixed Waste Facilities. Legacy MLLW is being treated, primarily offsite, in accordance with schedules contained in the *Site Treatment Plan* and then disposed offsite in a commercial disposal facility while newly generated MLLW is typically treated and disposed offsite within one year from time of generation.

SRS currently has approximately 400 cubic meters of legacy MLLW in both solid and liquid forms.

SRS is on schedule to disposition all legacy waste by the end of FY 2007, at which time the MLLW project will be in steady-state, meaning MLLW generated will typically be treated and disposed within one year.

See Figure 4.4, *Waste Management* for more details.

Planned End State (PES):

All legacy mixed waste will be disposed of in compliance with applicable regulations and requirements. SRS newly generated waste resulting from the EM cleanup project will be disposed as the waste is generated to prevent a legacy problem from being created for future generations. When at the end state, residual hazards will be minimal because the low volume and age of waste in storage will greatly reduce the possibility for releases. At this time all MLLW operations will be consolidated within the Solid Waste Management Facility in E Area. The *Performance Management Plan* (PMP) and the current contract between DOE and WSRC drive the MLLW project to steady-state well before the end state of 2025 through contract incentives. After 2025, waste management activities will be transitioned to a new landlord.

Risk:

Risk associated with the MLLW project include an uncontrolled release of a hazardous and/or radioactive substance to personnel or the environment. An uncontrolled release could impact the soil, air, and/or groundwater and direct exposure to either unprotected workers or the public to such hazards could result in detrimental health affects.

Controls

Risks associated with MLLW storage are mitigated by strict compliance with the requirements delineated in Title 40 Code of Federal Regulations (CFR) and Title 10 CFR 835. These regulations protect the worker, public, and environment from both hazardous materials and ionizing radiation. They are locally administratively implemented by site specific operating procedures and the facility waste acceptance criteria. Risks are physically managed through strict confinement by only storing MLLW in approved engineered containers followed by procedualized inspections. These containers are stored within RCRA-permitted facilities providing secondary confinement with impermeable floor coatings and sumps for containing any potential spills.

Depending on the nature of the hazardous material, airborne emissions may also require specialized control measures such as filtration and/or ventilation. These controls protect workers, the public, and the environment from

stored MLLW. During active management activities such as characterization or repackaging, workers are further protected with specialized personal protective equipment and engineered support equipment.

References

- *HW/MW Area Inspections* (U), SW 15.6-INP-HWMW01, Rev. 8
- *Routine Inspections for the Hazardous Waste/Mixed Waste Facility* (U) SW 15.6-INP-HWMW02, Rev. 7
- Procedure Manual 1S, *SRS Waste Acceptance Criteria Manual*, WAC 3.18 Rev. 4, 02/01/02

4.2.9. Hazard: Hazardous Waste

Hazard Description and Current Status:

Hazardous waste is a contained hazard at SRS.

Hazardous waste is a waste containing a hazardous component subject to the RCRA or TSCA. Currently, hazardous waste is stored in RCRA-permitted facilities at the N-Area Hazardous/Mixed Waste Facilities. Legacy hazardous waste generated prior to the Land Disposal Restriction effective date is being treated in accordance with schedules contained in the latest site contract as reflected in the current PMP.

SRS currently has approximately 60 cubic meters of legacy hazardous waste in both solid and liquid forms. SRS is on schedule to disposition all legacy hazardous waste by the end of FY 2006 at which time the hazardous waste project will be in steady-state, meaning waste generated will typically be treated and disposed within one year. Newly generated hazardous waste is typically stored onsite for less than 12 months, per RCRA regulations, and sent for permanent treatment and disposal offsite via commercial vendors.

Planned End State (PES):

All legacy hazardous waste will be disposed of in compliance with applicable regulations and requirements. SRS newly generated waste resulting from the EM cleanup project will be disposed as the waste is generated to prevent a legacy problem from being created for future generations. When at the end state, residual hazards will be minimal because the low volume and age of waste in storage will greatly reduce the possibility for releases. At this time all hazardous waste operations will be consolidated within the Solid Waste Management Facility in E Area, which is located in the center of SR. As stated above, the PMP and current contract drives the hazardous waste project to steady-state by FY 2006, well before the end state of 2025 by using contract incentives. After 2025, waste management activities will be transitioned to a new landlord.

Risk:

Risk associated with the hazardous waste project would be an uncontrolled release of a hazardous substance to the environment. An uncontrolled release could impact the soil, air, and/or groundwater and direct exposure to either unprotected workers or the public to such hazards could result in detrimental health affects.

Controls

Risks associated with hazardous waste storage are mitigated by strict compliance with the requirements delineated in Title 40 CFR. These regulations protect the worker, public, and environment from hazardous materials and are locally administratively implemented by site specific operating procedures and the facility waste acceptance criteria. Risk is physically managed through strict confinement by only storing hazardous waste in approved engineered containers followed by procedualized

inspections. These containers are stored within RCRA-permitted facilities providing secondary confinement with impermeable floor coatings and sumps for containing any potential spills. Depending on the nature of the hazardous material, airborne emissions may also require specialized control measures such as filtration and/or ventilation. These controls protect workers, the public, and the environment from stored hazardous waste. During active management activities such as characterization or repackaging, workers are further protected with specialized personal protective equipment and engineered support equipment.

References

- *HW/MW Area Inspections* (U), SW 15.6-INP-HWMW01, Rev. 8
- *Routine Inspections for the Hazardous Waste/Mixed Waste Facility* (U), SW 15.6-INP-HWMW02, Rev. 7
- Procedure Manual 1S, *SRS Waste Acceptance Criteria Manual*, WAC 3.18 Rev. 4, 02/01/02

4.2.10. Hazard: Sanitary Waste

Hazard Description and Current Status

Sanitary waste is a contained hazard at SRS.

Sanitary waste generated at SRS is typical municipal solid waste as governed by EPA-RCRA Subtitle D. SRS generates approximately 1000 tons per month. This includes deactivation and decommissioning (D&D) waste going to Three Rivers Solid Waste Authority landfill (TRSWA) located on site. Currently, all sanitary waste is being disposed onsite. No waste is being disposed offsite. The construction and demolition (C&D) landfill located in G area near central shops receives an additional approximately 3000 tons per month.

Planned End State (PES)

Sanitary waste will continue to be generated while there are people working at SRS. D&D waste will be generated based on the level of activity of the program. TRSWA will operate for approximately fifty years or until the landfill has met its permitted limits. This landfill, located on SRS, serves the site and nine surrounding counties. It complies will all EPA-RCRA Subtitle D requirements. Closure and post closure responsibility is for thirty years. Once closure monitoring for 30 years is complete (after the landfill stops receiving waste), the property reverts to Department of Energy Savannah River (DOE-SR) responsibility for long term stewardship.

Closure activities at the C&D landfill will begin once the landfill stops receiving waste. This includes placing a three foot clay cover over the landfill and establishing a permanent grass cover. Institutional control for the C&D landfill will be included in the long term stewardship program at SRS.

Risk

The risk from this program is to the groundwater. Both the TRSWA and the C&D landfill have the potential to impact the ground water. The TRSWA accepts typical chemicals and metals, as do all municipal landfills. The C&D landfill may have contaminates from construction debris.

Controls

TRSWA has a protective plastic liner under the landfill as required by RCRA Subtitle D. The C&D landfill does not have a protective liner, but the landfill restricts acceptance to mostly inert materials. At the end of the useful life of both landfills, they will be closed, as discussed in the Planned End States.

References

Waste Certification

- WSRC 1S Manual, *SRS Waste Acceptance Criteria Manual*
- SW 18 Manual, *Solid Waste and Infrastructure Manual*

P2 Program:

- WSRC 3Q Manual, *Environmental Compliance Manual*
- Manual E7, *Conduct of Engineering Manual*

Sanitary Waste

- WSRC Manual 3Q, *Environmental Compliance Manual*
- WSRC 1S Manual, *SRS Waste Acceptance Criteria Manual*

4.2.11. Hazard: EM Facilities

Hazard Description and Current Status

EM facilities are a contained hazard at SRS.

There are three major classifications for the facilities at SRS based on the significance and quantities of nuclear materials contained within them. At the end of CY 04 there were 139 nuclear facilities, 37 radiological facilities, and 646 other industrial facilities remaining to be deactivated and decommissioned by the EM Cleanup Project. In addition to radiological hazards, these facilities contain a variety of chemical and industrial hazards including but not limited to, asbestos, acids, caustics, solvents and other organics, Freon, open pits and sumps, and stored energy sources such as counter weights and charged springs. At the end of their mission, the facility hazard classifications will be downgraded through the steps of shutdown, de-inventory, deactivate, and decommission. In this process the hazards will either be removed or immobilized to reach the facility's decommissioned end state.

There are numerous facilities, such as the reactor facilities that at the end of their mission, completed the shut down and de-inventory steps. These facilities are maintained in a storage state until deactivation and decommissioning can proceed. New missions have been placed in some of these facilities such as C and K Reactors.

EM Facilities includes closing the HLW tanks and industrial, radiological and nuclear facilities. Once a facility's mission is complete, the facility is deactivated and placed in interim safe storage or decommissioned to its end state. The end state will either be in-situ disposal or demolition unless reused to support other long-range federal missions at SRS or designated for historical preservation or economic development. In-situ disposal is applicable for hardened, contaminated facilities such as reactors, basins, canyons, and tanks. The rationales for this option include the following:

- Location is acceptable for in-situ disposal.
- Removal of the risk outweighs the benefits.
- Facility meets regulatory requirements for acceptable, long-term risk to the public and the environment.

Demolition is appropriate for non-hardened contaminated facilities or non-hardened, uncontaminated facilities. Examples include Canning Building (313-M) or administrative buildings. The rationales for this option include the following:

- Facility is not a candidate for in-situ disposal.
- Contaminants may be chemicals and radionuclides.
- Degradation of the facility will lead to rising surveillance and maintenance costs.
- Demolition costs are relatively low.
- The salvage value off-sets demolition cost.
- Demolition avoids future regulatory exposure.

Current plans are for 857 facilities to be demolished and 105 facilities to have in-situ disposal. All of the remaining 49 HLW tanks are planned to undergo in situ disposal. However, this list is being re-evaluated as part of the preservation, management and treatment of the National Register of Historic Places (NRHP)-eligible historic properties within the SRS Cold War Historic District.

The *Savannah River Site's Cold War Built Environment Cultural Resources Management Plan (CRMP)* contains the process for reaching decisions concerning the future treatment of SRS Cold Was SRHP-eligible historic properties, taking into account their historic significance, integrity, future interpretation, and treatment. The CRMP was developed as a result of the *Programmatic Agreement (PA) Among the U. S. Department of Energy (DOE), the South Carolina Historic Preservation Office (SHPO) and the Advisory Council on Historic Preservation (ACHP) for the Management of Cold War Historic Properties on the Savannah River Site (SRS), Aiken, Barnwell, and Allendale Counties, South Carolina.*

The ranking and sequencing methodology was developed to address factors impacting near-term and long-term D&D program planning. Three factors affect facility ranking and sequencing decisions:

- environmental, safety and health risk,
- programmatic risk, and
- economics

Specifically, environmental, safety and health risks consider cumulative radiological and chemical source terms, proximity to site boundaries, and facility conditions. Programmatic risk considers the complexity, characterization, and integration with the Soil and Groundwater Project to achieve area closure.

The drivers for this program include DOE Policy 430.1, *Land and Facility Use Planning,* DOE Guidance 540.1-4, *Decommissioning Implementation Guide* and *Savannah River Site's Cold War Built Environment Cultural Resources Management Plan (CRMP)*. Regulator involvement through the Core Team (see Section 4.3.12, *Hazard -- Soil and Groundwater*) helps to implement the July 2003 *Memorandum of Agreement for Achieving an Accelerated Cleanup vision for the Savannah River Site*.

Planned End State (PES)

The end state vision for the D&D program is that SRS remains a federal property with a central core area, surrounded by an environmental buffer zone. Facilities within the central core will be turned over for NNSA mission-related operations, deactivated to an appropriate condition for long-term storage or decommissioned. Remaining facilities outside the central core will be deactivated to an appropriate condition for long-term storage or decommissioned and eventually turned over to NNSA mission-related operations. By 2006 the decommissioning of facilities in T, D and M Areas will be complete.

The *SRS EM Integrated Deactivation and Decommissioning Plan* was developed as a tool for planning and accelerating closure of EM facilities, waste tanks, and inactive waste sites from 2003 – 2025. The plan assumes no programmatic reuse of any site facilities, including infrastructure by DOE or other federal program, nor does it account for any historic facilities or economic development. The plan reflects guidance from the *DOE EM Program Performance Management Plan, Top-to-Bottom Review*, DOE guidance regarding risk-based ranking, and DOE/Westinghouse Savannah River Company (WSRC) Contract Modification 100. The plan also documents the planned EM end states for facilities, waste tanks, and inactive waste sites. Reflecting its comprehensive purpose, the D&D plan integrates strategic plans from SRS programs, maintains a repository of

facility information, including rough order-of-magnitude (ROM) cost estimates, hazard category, and end state; and provides a methodology for the scheduling of facility closure, based on economic, health and safety, and programmatic risks. This information in combination with mission, budget, regulator influence and agreements, and strategic objectives will dictate the execution strategy for facility D&D.

Each area description has an EM Facility D&D table (see Section 4.4, *Hazard-Specific Discussion by Areas*) that summarizes the total EM facilities in the area (by facility hazard type, number of facilities and square footage), the current status of D&D completions through FY 2004 (number of facilities where D&D is complete) and the planned 2025 end state for final decommissioning (number of facilities demolished or in situ decommissioned). The D&D end state assumes all EM facilities will be decommissioned, and none will be reused by DOE or other federal program or for historical preservation or economic development. The information presented for facilities in each area was obtained directly from the *SRS EM Integrated D&D Plan* (Rev. 1) and is consistent with the total listing of EM Facilities in the WSRC contract. Additional information related to EM Facility hazard types, conceptual site models and decommissioned end states is available in Appendix K, *Conceptual Site Models for Typical Hazards*.

The majority of the facilities on site will be demolished to the ground level leaving only a clean slab. Contaminants (chemical and/or radiological) will be removed or immobilized such that all transferable contamination is removed, and the calculated risk from the fixed contamination is below the threshold for the industrial worked scenario. The robust structural integrity of the hardened reactor and canyon facilities will be credited for determination of the quantities of contaminants that can remain.

Site Totals			Current Status	End State	
Facility Haz Type	No.	Sq Ft	Comp	DEM	ISD
Nuc	144	3,916,656	5	111	33
Rad	38	901,683	1	30	8
Oth Ind	780	6,541,246	134	716	64
HLW Tanks	51	N/A	2	0	51
Total	1013	11,359,585	142	857	156

Nuc- Nuclear
Rad – Radiological
Oth Ind – Other Industrial
No. – Number of facilities
Sq Ft – Square Feet
Comp – Complete
Dem – Demolished
ISD – In situ disposal

Risk:

At the completion of decommissioning, the facility hazards will either be removed or stabilized such that no new releases are created and the facility end state will support closure of the area by the Soil and Groundwater Project (SCP). To support the Area Closure Program the calculated risk from any remaining contaminants must be below the threshold for the industrial worker scenario.

Controls

During performance of D&D activities, hazards are controlled through implementation of the Integrated Safety Management System (ISMS) based site work practices and requirements. Radiological, chemical, and industrial hazards are tracked and managed throughout the transition from operations, shut down, de-inventory, deactivation, and decommissioning. The end state objective of the D&D program is

to remove and/or immobilize hazards such that no new waste units are created and future controls and monitoring is not required on a facility by facility basis. End states for each facility are integrated with the strategy for area closure which will encompass the overall plan for future controls for the area.

References

- *SRS Environmental Management Program Performance Management Plan*, 2005
- *SRS Environmental Management Integrated Deactivation and Decommissioning Plan*, May 2003

4.2.12. Hazard: Soil and Groundwater

Hazard Description and Current Status

Soil and groundwater are being remediated due to released hazards at SRS.

Originally, SRS had 515 waste units – both soil and groundwater. Of these, 497 were surface units and 18 groundwater units. Of the surface units, 296 have remediation complete, 173 are in assessment and 28 are in remediation. A portion of the surface units also have a groundwater component. Five of the groundwater remediations are complete, six are in assessment, and seven are in remediation.

As part of the Soil and Groundwater Project Risk Evaluation Process, the following risk factors are considered:

- toxicity hazard and extent of contamination
- migration and mobility of contaminants
- similarities of source term
- geographic location, including proximity to operating facilities and to the site boundary
- future land use
- regulatory commitments and expectations.

To facilitate the acceleration of risk reduction, a core team of regulators, Department of Energy – Savannah River (DOE-SR) and WSRC staff members serves as the basis for closure acceleration. This group strives to 1) facilitate effective and efficient risk management and remedial selection decisions; and 2) streamline the administrative process (i.e., regulatory documentation), whenever possible. These environmental restoration activities are being sequenced with decommissioning activities to support objectives of closing site areas to delete them from the National Priorities List (NPL).

Planned End State (PES)

All SRS soil remediations are currently and projected to accommodate the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) cancer risk assessment levels of either less than one in a million (less than 10^{-6}) for a residential (unrestricted) scenario or between a one in ten thousand to one in a million (10^{-4} to 10^{-6}) industrial worker scenario with institutional controls. A corollary approach is implemented for non-cancer risk (presented in terms of hazard indexes) but is not presented to simplify SRS's end state concept. Evidence of this is depicted for the completed units on Tables 4.1a, *Planned End State By Watersheds (G Area Only)*, and 4.3a, *SRS End State Vision Planned by Area* in Appendices I, *Watershed Conceptual Site Models and Hazard Tables* and J, *Area Conceptual Site Models and Hazard Tables*, with the end state for all complete SGP units identified by one of the aforementioned risk categories.

SRS water (i.e., groundwater and surface water) hazards and resultant cleanup strategies are based on maximum contaminant limits (MCLs). MCLs are the highest level of a contaminant that is allowed in drinking water which includes the surface or subsurface source of supply. MCLs are enforced through the *South Carolina Primary Drinking Water Regulations* for monitoring, reporting, record retention requirements and public notification. The end state for SRS waters is to remediate the media

until such time that it meets MCLs throughout the entire contaminated volume of water. In addition, SRS utilizes Mixing Zones, which are essentially temporary permits to exceed MCLs in a portion of a plume to allow a remedy (active or passive) to have the necessary time to achieve MCLs throughout an aquifer. SRS does not foresee a change to this groundwater remedial strategy. SRS does apply the following graded approach when pursuing the groundwater end state:

1) aggressive/active remediation technologies to eliminate or control source of contamination (e.g., pump and treat, in situ destruction, aggressive immobilization);
2) moderately aggressive remediation alternatives or a combination of active and passive remedial measures for the primary groundwater plume (e.g., barrier walls, recirculation wells); and
3) passive and innovative technologies (e.g., monitored natural attenuation, phytoremediation).

This strategy is essential in that it is technically impracticable and cost prohibitive to actively remediate all SRS waters to MCL levels. Furthermore, this strategy maximizes short-term cost expenditures on high concentration/source reduction groundwater contamination and relies on long-term natural, passive means on the least contaminated portion of groundwater plumes.

It is evident that SRS has utilized and benefited from the graded approach when one compares the CERCLA and RCRA waste units that have either Interim or Final Record of Decisions with a component of the remedy that is defined as a Mixing Zone, Monitored Natural Attenuation, and/or passive remediation. These include:

- passive soil vapor extraction with monitoring at Miscellaneous Chemical Basin/Metals Burning Pit and A-Area Burning/Rubble Pits
- mixing zones at D-Area Oil Seepage Basin, Old F-Area Seepage Basin, and L-Area Burning/Rubble Pit/Rubble Pile/Gas Cylinder Disposal Facility
- monitoring at D-Area Burning Rubble Pits, and C, F, K, P-Area Coal Pile Runoff Basins
- monitored natural attenuation at K-Area Burning/Rubble Pit
- passive remediation with natural biodegradation at P-Area Burning/Rubble Pit.

SRS has made gross estimates of the volume of groundwater addressed by these low energy/passive approaches and compared this volume to a hypothetical active remedy (i.e., pump and treat) applied to the same volume. Applying broad assumptions in support of the comparison, SRS has used these alternative approaches for active remediation to address more than 3 billion gallons of groundwater. To put this quantity in perspective, the National Mall in Washington, D.C., is roughly 309 acres; 3 billion gallons of water would submerge the entire mall to a depth of approximately 30 feet.

Furthermore, SRS has virtually institutionalized the graded approach for all of the groundwater remediations conducted under the RCRA program. These include the following:

- phytoremediation for the Mixed Waste Management Facility Groundwater
- bioremediation with Mixing Zone for the Sanitary Landfill Groundwater
- barrier walls with base injection for the F&H Areas Seepage Basin Groundwater
- passive soil vapor extraction for the A/M Area Groundwater.

These efforts will result in remediation of billions of gallons of groundwater through passive remediation, and/or natural processes in place of more aggressive remediation technologies.

Risk

Soil and groundwater risk is the potential of chemical and/or radiological contamination in the environmental media to adversely affect human health and the environment.

Controls

Managing this risk includes the following methodologies: identifying the nature of the environmental contamination problem; investigating the extent, fate, and transport of the contamination; evaluating and assessing the risk to human health and the environment; identifying, evaluating, and selecting an appropriate remedial technology; and finally, designing and implementing the selected remedial technology.

References

RCRA and CERCLA are the primary controls that govern hazardous waste and contaminant releases.

The *National Oil and Hazardous Substances Pollution Contingency Plan* and the *Federal Facility Agreement for the Savannah River Site*, WSRC-OS-94-42, 10-2-96 are the primary documents that describe the processes that are implemented to cleanup existing environmental contamination and prevent future contaminant releases to the environment for SRS soil and groundwater waste sites.

Integrator Operable Units (IOUs)

Integrator Operable Units (IOUs) are the surface water bodies draining all six SRS watersheds. As the term implies, IOUs are the integrators, or collection points, of potential contamination discharged to surface water or groundwater, including the Savannah River floodplain and its contiguous wetlands. These units represent possible paths of contamination from SRS activities to offsite receptors and the environment. As such, the IOU program, as established by SRS, is designed to accomplish the following:

1) assess their risk levels and any ongoing impact from active and inactive waste units across the site;
2) identify and implement any needed early actions; and
3) complete final regulatory assessment and monitor previous remedial actions as necessary.

The SRS staff and stakeholders associated with SRS environmental cleanup have long recognized that the five major site streams and their associated flood plains and wetlands, along with the Savannah River Swamp, form primary hydrologic pathways for contaminant migration from SRS to the Savannah River. As far back as 1995, these pathways were identified as IOUs. Each stream is called an IOU because it integrates the effluents from the operable units within its watershed. SRS has six IOUs (Fourmile Branch, Lower Three Runs, Pen Branch, Savannah River Floodplain Swamp, Steel Creek, and Upper Three Runs). Several are contaminated from past releases direct to the streams. In addition, some IOUs receive contamination from past spills, leaks, etc. that impacted groundwater which now outcrops into the IOUs. Working in conjunction with EPA, SCDHEC and the SRS Citizens Advisory Board (CAB), DOE-SR and WSRC established the IOUs as specified Waste Units and included them in Appendix C of the *Federal Facility Agreement* (FFA). This action formally launched their cleanup and provided a means of tracking progress in their assessment and remediation.

This innovative IOU cleanup approach is based on sound reasoning and strategic planning to accelerate whole area closure. Remediation of the majority of SGP's inactive waste units involves addressing discrete releases requiring specific assessment and various means of remediation. The IOUs augment these actions by providing a common sense approach—to address SRS cleanup by looking at the site on a more comprehensive scale. By focusing on the site's primary tributaries to the Savannah River, the IOUs address the watersheds that make up the whole of SRS's 310-square miles of surface area. The IOUs provide an effective, protective strategy for SGP's cleanup effort. As such, this ongoing assessment and remediation function enables long-term monitoring for the various surface pathways against the potential release of hazardous substances from operable units or facilities within a watershed to other receptors. Further, as early action opportunities are identified, the assessment of these IOUs serves to provide near term protection of human health and the environment.

4.3 Hazard Specific Discussion by Watersheds

There are five main watersheds that originate on, or pass through the SRS before discharging into the Savannah River/Floodplain Swamp. The SRS hazard evaluation is comprised of the five onsite watersheds (Upper Three Runs, Fourmile Branch, Pen Branch, Steel Creek, and Lower Three Runs) and the Savannah River/Floodplain Swamp, which is the receiving body for the onsite streams. All of these watersheds, including the portion of the Savannah River adjacent to SRS, and the stream/wetlands associated with the IOUs integrate the potential contamination discharged to surface water or groundwater from SRS operations. The IOUs are the primary pathways for offsite transport of site-related contamination. A general site-wide conceptual site model is provided in Figure 4.0, *SRS Sitewide Conceptual Site Model*, located in Appendix I, *Watershed Conceptual Site Models and Hazard Tables***,** which depicts sources of contamination and contaminant migration pathways.

The hazard information presented in the following pages is segregated in watershed-level and area-level discussions. The sections are organized to avoid duplication of area hazard information that impact more than one watershed. G-Area (general site) hazards (including the IOUs) are generally located outside of specific areas and are therefore addressed within each watershed level discussion presented in Sections 4.3.1 – 4.3.6. The conceptual site models (CSMs) for the watershed level discussions show G-Area units and IOUs that are "to go." Each area hazard (i.e., A Area, B Area, etc.) is presented individually beginning with Section 4.4.1 and includes the soil and groundwater hazards within the respective area. Figures in Appendix I, *Watershed Conceptual Site Models and Hazard Tables*, and Appendix J, *Area Conceptual Site Models and Hazard Tables*, are provided that show "complete" and "to go" units visible within the extent of the figure. CSMs are provided in the area-level discussions and reflect "to go" units only.

For areas that are on geographic and/or hydrogeologic divides and influence more than one watershed, a CSM is provided for each watershed impacted by the area.

4.3.1 Upper Three Runs Watershed

Watershed Description

Upper Three Runs (UTR) originates northeast of the SRS boundary and follows a southwesterly direction for approximately 30 kilometers (km) (19 miles) within the SRS boundary and discharges directly into the Savannah River approximately 1.5 km (0.9 miles) upstream of T-Area. Within the SRS boundary, the Upper Three Runs Watershed drains approximately 250 square kilometers (km^2) (97 square miles [mi^2]). The entire watershed drains about 645 km^2 (245 mi^2). The northern portion of the watershed within the site boundary includes portions of A Area, M Area, and the Savannah River National Laboratory (SRNL).

The southern portion of the Upper Three Runs Watershed includes the majority of the B-Area Administrative Center, S-Area Vitrification Facility and Z-Area Saltstone Facility, as well as portions of E-Area Waste Management Complex, F and H Separations Areas, and R-Reactor Area. The main tributaries within the SRS portion of the Upper Three Runs Watershed include Tinker Creek and Tims Branch. Smaller tributaries include Crouch Branch, McQueen Branch, and Mill Creek.

Watershed Hazards

The conceptual site model for the UTR Watershed is shown in Figure 4.1b, *Upper Three Runs CSM*, in Appendix I, *Watershed Conceptual Site Models and Hazard Tables*, and

depicts the potential sources of contamination, migration pathways, exposure media and potential receptors. Table 4.1a, *SRS End State Vision Planned by Watersheds (G-Area Only)* in Appendix I, *Watershed Conceptual Site Models and Hazard Tables*, provides a listing of the G Area hazards and facilities with associated characteristics. The major hazards in the UTR Watershed that require remediation are located in A Area, B Area, E Area, F Area, G Area (Steed Pond, UTR IOU), H Area, M Area, R Area, and S Area.

Current Watershed Cleanup Status

Table 4.1a, *SRS End State Vision Planned by Watersheds (G-Area Only)* in Appendix I, *Watershed Conceptual Site Models and Hazard Tables*, provides the current status for the G-Area hazards and the known remedial technology implemented for completed units. For hazards in the "to go" phase where the response action has not been selected, Hazard Type CSMs located in Appendix K, *Conceptual Site Models for Typical SRS Hazards (Soil, Groundwater, EM Facilities, HLW Tanks),* provide the response actions likely to be implemented by media for each hazard type.

Table 4.2, *SRS End State Vision Hazard Type Crosswalk for Watershed "To Go" Units (G-Area Only),* in Appendix I, *Watershed Conceptual Site Models and Hazard Tables*, depicts a crosswalk that categorizes each of the "to go" G-Area hazards and facilities in the UTR Watershed to a hazard type CSM located in Appendix K, *Conceptual Site Models for Typical SRS Hazards (Soil, Groundwater, EM Facilities, HLW Tanks).* All remaining hazards will undergo characterization, risk analysis, and evaluation for the appropriate remedial technologies as depicted in the hazard type CSMs and Table 4.2, SRS End State Vision Hazard Type Crosswalk for Watershed "To Go" Units (G-Area Only).

Twenty-seven G Area waste units were identified in the UTR Watershed of which 24 are complete. For the remaining three waste units, one is categorized as a Hazard Type 2 (Radiological Seepage Basins and Pits), one unit as Hazard Type 9 (Miscellaneous Sites), and one unit as Hazard Type 11 (Integrator Operable Units). Hazard sources to be evaluated for the remaining waste units include nonradioactive rubble and building debris, metals, organic and inorganic constituents, and radionuclides.

Planned Watershed End State

The current and projected end state for G-Area units within the UTR Watershed is to accommodate a final risk level of 10^{-4} to 10^{-6} for the industrial worker with institutional controls.

4.3.2 Fourmile Branch Watershed

Watershed Description

The Fourmile Branch (FMB) Watershed, which is located entirely within the SRS boundary, originates near the center of SRS and follows a southwesterly direction for approximately 24 km (15 mi). In the lower reaches, Fourmile Branch broadens and flows through a delta that has been formed by the deposition of sediments during reactor operations. The majority of the flow discharges into the Savannah River and a small portion of the creek flows west and enters Beaver Dam Creek. When the Savannah River floods, water from Fourmile Branch flows into the Savannah River swamp. The watershed drains about 57 km^2 (22 mi^2) and includes several SRS facilities: C Area (C Reactor), N Area (Central Shops), F, H, and E Areas (General Separations Areas), and the Solid Waste Disposal Facility.

At its headwaters, Fourmile Branch is a small black water stream that has been relatively unimpacted by historical SRS operations. Fourmile Branch has historically and currently receives effluents from F, H, and C Areas, as

well as contaminated groundwater discharges that have migrated from SRS facilities and waste units into the stream and its tributaries.

Watershed Hazards

The conceptual site model for the FMB Watershed is shown in Figure 4.2b, *Fourmile Branch CSM*, and depicts the potential sources of contamination, migration pathways, exposure media and potential receptors. Table 4.1a, *SRS End State Vision Planned by Watersheds (G-Area Only)* in Appendix I, *Watershed Conceptual Site Models and Hazard Tables*, provides a listing of the G Area hazards and facilities with associated characteristics. The major hazards in the FMB Watersheds that require remediation are located in C Area, E Area, F Area, H Area, G Area (FMB IOU), and N Area.

Current Watershed Cleanup Status

Table 4.1a, *SRS End State Vision Planned by Watersheds (G-Area Only)* in Appendix I, *Watershed Conceptual Site Models and Hazard Tables*, also provides the current status for the G-Area hazards and the known remedial technology implemented for completed units. For hazards in the "to go" phase where the response action has not been selected, Hazard Type CSMs located in Appendix K, *Conceptual Site Models for Typical SRS Hazards (Soil, Groundwater, EM Facilities, HLW Tanks)*, provide the response actions likely to be implemented by media for each hazard type.

Table 4.2, *SRS End State Vision Hazard Type Crosswalk for Watershed "To Go" Units (G-Area Only)*, depicts a crosswalk that categorizes each of the "to go" G-Area hazards and facilities in the FMB Watershed to a Hazard Type CSM located in Appendix K, *Conceptual Site Models for Typical SRS Hazards (Soil, Groundwater, EM Facilities, HLW Tanks)*. All remaining hazards will undergo characterization, risk analysis, and evaluation for the appropriate remedial technologies as depicted in the Hazard Type CSMs and Table 4.2, *SRS End State Vision Hazard Type Crosswalk for Watershed "To Go" Units (G-Area Only)*

Four G Area waste units were identified in the FMB Watershed of which three are complete. The remaining waste unit is categorized as Hazard Type 11 (Integrator Operable Units). Hazard sources to be evaluated for the remaining waste unit include metals, organic and inorganic constituents, and radionuclides.

Planned Watershed End State

The current and projected end state for G-Area units within the FMB Watershed is to accommodate a final risk level of 10^{-4} to 10^{-6} for the industrial worker with institutional controls.

4.3.3 Pen Branch Watershed

Watershed Description

The Pen Branch (PB) Watershed originates near the center of SRS and follows in a southwesterly direction for approximately 18 km (11 mi) discharging into the Savannah River floodplain swamp rather than flowing directly into the Savannah River. The PB Watershed is located entirely on SRS property. Pen Branch flows southwesterly from its headwaters, about 3.2 km (2 mi) east of K-Area, to the Savannah River swamp. After entering the swamp, PB flows parallel to the Savannah River for about 8 km (5 mi) before it enters and mixes with the water of Steel Creek about 0.4 km (0.2 mi) from the mouth of Steel Creek at the Savannah River. The PB Watershed drains about 56 km^2 (21 mi^2) and includes the entirety of K Area (K Reactor) and portions of N Area (Central Shops) and waste units associated with L Area (L Reactor). Indian Grave Branch is the principal tributary of Pen Branch.

Watershed Hazards

The conceptual site model for the PB Watershed is shown in Figure 4.3b, *Pen Branch CSM* in Appendix I, *Watershed Conceptual Site Models and Hazard Tables*, and depicts the potential sources of contamination, migration pathways, exposure media and potential receptors. Table 4.1a, *SRS End State Vision Planned by Watersheds (G-Area Only)*, provides a listing of the G Area hazards and facilities with associated characteristics. The major hazards in the PB Watershed that require remediation are located in G Area (CMP Pits, PB IOU), K Area, L Area, and N Area.

Current Watershed Cleanup Status

Table 4.1a, *SRS End State Vision Planned by Watersheds (G-Area Only)*, in Appendix I, *Watershed Conceptual Site Models and Hazard Tables*, provides the current status for the G-Area hazards and the known remedial technology implemented for completed units. For hazards in the "to go" phase where the response action has not been selected, Hazard Type CSMs located in Appendix K, *Conceptual Site Models for Typical SRS Hazards (Soil, Groundwater, EM Facilities, HLW Tanks)*, provide the response actions likely to be implemented by media for each hazard type.

Table 4.2, *SRS End State Vision Hazard Type Crosswalk for Watershed "To Go" Units (G-Area Only)* in Appendix I, *Watershed Conceptual Site Models and Hazard Tables*, depicts a crosswalk that categorizes each of the "to go" G-Area hazards and facilities in the PB Watershed to a Hazard Type CSM located in Appendix K, *Conceptual Site Models for Typical SRS Hazards (Soil, Groundwater, EM Facilities, HLW Tanks)*. All remaining hazards will undergo characterization, risk analysis, and evaluation for the appropriate remedial technologies as depicted in the hazard type CSMs and Table 4.2, *SRS End State Vision Hazard Type Crosswalk for Watershed "To Go" Units (G-Area Only).*

Ten G Area waste units were identified in the PB Watershed of which two are complete. From the remaining eight waste units, seven units are categorized as Hazard Type 5 (Nonradiological Rubble Piles and Pits) and one unit is categorized as Hazard Type 11 (Integrator Operable Units). Hazard sources to be evaluated for the remaining waste units include nonradioactive rubble and building debris, metals, organic and inorganic constituents, and radionuclides.

Planned Watershed End State

The current and projected end state for G-Area units within the PB Watershed is to accommodate a final risk level of 10^{-4} to 10^{-6} for the industrial worker with institutional controls.

4.3.4 Steel Creek Watershed

Watershed Description

The headwaters of Steel Creek (SC) originate near P-Reactor, southwest of Par Pond. SC flows southwesterly about 3 km (1.8 mi) before it enters the headwater of L Lake. L Lake is 6.5 km (4.0 mi) long with an area of about 1034 acres. Flow from the outfall of L Lake dam travels about 5 km (3 mi) before entering the Savannah River swamp and another 3 km (1.8 mi) before entering the Savannah River. SC has received thermal discharges and increased flow from reactor operations that produced an extensive delta where SC enters the Savannah River floodplain swamp. Meyers Branch, the main tributary of SC, flows approximately 10 km (6.2 mi) before entering SC. Meyers Branch is relatively undisturbed by SRS operations. The total area drained by the Steel Creek and Meyers Branch system is about 91 km^2 (35 mi^2) and includes portions of P and L Areas.

Watershed Hazards

The conceptual site model for the SC Watershed is shown in Figure 4.4b, *Steel Creek CSM* in Appendix I, *Watershed Conceptual Site Models and Hazard Tables*, and depicts the potential sources of contamination, migration pathways, exposure media and potential receptors. Table 4.1a, *SRS End State Vision Planned by Watersheds (G-Area Only) i*n Appendix I, *Watershed Conceptual Site Models and Hazard Tables*, provides a listing of the G Area hazards and facilities with associated characteristics. The major hazards in the SC Watershed that require remediation are located in G Area (L Lake, SC IOU), P Area, and L Area.

Current Watershed Cleanup Status

Table 4.1a, *SRS End State Vision Planned by Watersheds (G-Area Only)* in Appendix I, *Watershed Conceptual Site Models and Hazard Tables*, provides the current status for the G-Area hazards and the known remedial technology implemented for completed units. For hazards in the "to go" phase where the response action has not been selected, Hazard Type CSMs located in Appendix K, *Conceptual Site Models for Typical SRS Hazards (Soil, Groundwater, EM Facilities, HLW Tanks),* provide the response actions likely to be implemented by media for each hazard type.

Table 4.2, *SRS End State Vision Hazard Type Crosswalk for Watershed "To Go" Units (G-Area Only)* in Appendix I, *Watershed Conceptual Site Models and Hazard Tables,* depicts a crosswalk that categorizes each of the "to go" G-Area hazards and facilities in the SC Watershed to a hazard type CSM located in Appendix K, *Conceptual Site Models for Typical SRS Hazards (Soil, Groundwater, EM Facilities, HLW Tanks*). All remaining hazards will undergo characterization, risk analysis, and evaluation for the appropriate remedial technologies as depicted in the Hazard Type CSMs and Table 4.2, *SRS End State Vision Hazard Type Crosswalk for Watershed "To Go" Units (G-Area Only),* also in Appendix I, *Watershed Conceptual Site Models and Hazard Tables.*

Nine G Area waste units were identified in the SC Watershed of which six are complete. From the remaining three waste units, one unit is categorized as Hazard Type 5 (Nonradiological Rubble Piles and Pits), one unit is categorized as Hazard Type 9 (Miscellaneous Sites), and one unit is categorized as Hazard Type 11 (Integrator Operable Units). Hazard sources to be evaluated for the remaining waste units include nonradioactive rubble and building debris, metals, organic and inorganic constituents, and radionuclides.

Planned Watershed End State

The current and projected end state for G-Area units within the SC Watershed is to accommodate a final risk level of 10^{-4} to 10^{-6} for the industrial worker with institutional controls.

4.3.5 Lower Three Runs Watershed

Watershed Description

The Lower Three Runs (LTR) Watershed is located on the eastern portion of SRS and lies partially within the SRS boundary. The LTR stream is the principle surface water body within the watershed and is located entirely on SRS property, including the narrow corridor that extends from Patterson Mill to the confluence with the Savannah River. The watershed, which drains about 460 km^2 (178 mi^2), includes the R-Reactor Area, a portion of P-Reactor-Area, ecological laboratories and various Soils and Groundwater Project waste sites. Industrial facilities located outside the eastern SRS boundary are also located within the LTR Watershed. A mainstream impoundment, Par Pond, was constructed along with several other

retaining ponds on the headwaters of LTR to receive reactor effluent.

Watershed Hazards

The conceptual site model for the LTR Watershed is shown in Figure 4.5b, *Lower Three Runs CSM* in Appendix I, *Watershed Conceptual Site Models and Hazard Tables*, and depicts the potential sources of contamination, migration pathways, exposure media and potential receptors. Table 4.1a, *SRS End State Vision Planned by Watersheds (G-Area Only)* in Appendix I, *Watershed Conceptual Site Models and Hazard Tables*, provides a listing of the G Area hazards and facilities with associated characteristics. The major hazards in the LTR Watershed that require remediation are located in G Area (LTR IOU, Par Pond), R Area, and P Area.

Current Watershed Cleanup Status

Table 4.1a, *SRS End State Vision Planned by Watersheds (G-Area Only)*, provides the current status for the G-Area hazards and the known remedial technology implemented for completed units. For hazards in the "to go" phase where the response action has not been selected, Hazard Type CSMs located in Appendix K, *Conceptual Site Models for Typical SRS Hazards (Soil, Groundwater, EM Facilities, HLW Tank*s), provide the response actions likely to be implemented by media for each hazard type.

Table 4.2, *SRS End State Vision Hazard Type Crosswalk for Watershed "To Go" Units (G-Area Only)* in Appendix I, *Watershed Conceptual Site Models and Hazard Tables*, depicts a crosswalk that categorizes each of the "to go" G-Area hazards and facilities in the LTR Watershed to a Hazard Type CSM located in Appendix K, *Conceptual Site Models for Typical SRS Hazards (Soil, Groundwater, EM Facilities, HLW Tanks).* All remaining hazards will undergo characterization, risk analysis, and evaluation for the appropriate remedial technologies as depicted in the hazard type CSMs and Table 4.2, *SRS End State Vision Hazard Type Crosswalk for Watershed "To Go" Units (G-Area Only).*

Twelve G Area facilities were identified in the LTR Watershed of which five are complete. From the remaining seven waste units, four units are categorized as Hazard Type 5 (Nonradiological Rubble Piles and Pits), one unit as Hazard Type 7 (Sludge Application Sites), one unit as Hazard Type 9 (Miscellaneous Sites), and one unit as Hazard Type 11 (Integrator Operable Units). Hazard sources to be evaluated for the remaining waste units include nonradioactive rubble and building debris, metals, organic and inorganic constituents, and radionuclides.

Planned Watershed End State

The current and projected end state for G-Area units within the LTR Watershed is to accommodate a final risk level of 10^{-4} to 10^{-6} for the industrial worker with institutional controls.

4.3.6 Savannah River / Floodplain / Swamp Watershed

Watershed Description

The Savannah River (SR) Watershed drains about 27,388 km^2 (10,574 mi^2) and includes western South Carolina, eastern Georgia, and a small portion of southwestern North Carolina. Approximately 31% or 8631 km^2 of the watershed area is located in the Coastal Plain that includes Augusta (Georgia), SRS, and the city of Savannah to the Atlantic Ocean. The Savannah River and Floodplain Swamp IOU includes the 100-year floodplain (including the Savannah River swamp) and any continuous wetlands including the Savannah River adjacent and down gradient of the SRS. This area encompasses approximately 72 km (45 mi) from the northern boundary of SRS above Upper

Three Runs southward to the US. Highway 301 Bridge. The five major SRS streams feed into the Savannah River and floodplain swamp (Upper Three Runs, Fourmile Branch, Pen Branch, Steel Creek, and Lower Three Runs.) The Savannah River and Floodplain Swamp Watershed includes portions of A/M-Area, D-Area, and TNX.

Watershed Hazards

The conceptual site model for the SR Watershed is shown in Figure 4.6b, *Savannah River/Floodplain CSM* in Appendix I, *Watershed Conceptual Site Models and Hazard Tables,* and depicts the potential sources of contamination, migration pathways, exposure media and potential receptors. Table 4.1a, *SRS End State Vision Planned by Watersheds (G-Area Only)* in Appendix I, *Watershed Conceptual Site Models and Hazard Tables,* provides a listing of the G Area hazards and facilities with associated characteristics. The major hazards in the SR Watershed that require remediation are located in A/M-Area, D-Area, and TNX. There are no G-Area "to go" units with the exception of the Savannah River / Floodplain / Swamp IOU.

Current Watershed Cleanup Status

Table 4.1a, *SRS End State Vision Planned by Watersheds (G-Area Only),* provides the current status for the G-Area hazards and the known remedial technology implemented for completed units. For hazards in the "to go" phase where the response action has not been selected, Hazard Type CSMs located in Appendix I, *Watershed Conceptual Site Models and Hazard Tables,* provide the response actions likely to be implemented by media for each hazard type.

Table 4.2, *SRS End State Vision Hazard Type Crosswalk for Watershed "To Go" Units (G-Area Only)* in Appendix I, *Watershed Conceptual Site Models and Hazard Tables,* depicts a crosswalk that categorizes each of the "to go" G-Area hazards and facilities in the SR Watershed to a hazard type CSM located in Appendix K, *Conceptual Site Models for Typical SRS Hazards (Soil, Groundwater, EM Facilities, HLW Tanks).* All remaining hazards will undergo characterization, risk analysis, and evaluation for the appropriate remedial technologies as depicted in the hazard type CSMs and Table 4.2, *SRS End State Vision Hazard Type Crosswalk for Watershed "To Go" Units (G-Area Only).*

Eight G Area waste units were identified in the SR Watershed of which seven are complete. The remaining waste unit is categorized as Hazard Type 11 (Integrator Operable Units). Hazard sources to be evaluated for the remaining waste unit include metals, organic and inorganic constituents, and radionuclides.

Planned Watershed End State

The current and projected end state for G-Area units within the SR Watershed is to accommodate a final risk level of 10^{-4} to 10^{-6} for the industrial worker with institutional controls.

4.4 Hazard-Specific Discussion by Areas

Note: Area Totals for EM Facilities (Area D&D Tables) below— "Current Status Complete" is being updated, and the numbers shown represent facility decommissioning completions as of the March 30, 2004 *Risk-Based End State Vision for the Savannah River Site.* More current data will be presented in the Final *Savannah River Site End State Vision*.

4.4.1 A Area

Area Description

A Area is located in the northwest part of SRS and is approximately 1,050 m (3,500 ft) from the plant boundary and covers approximately 400

acres (1.6 km^2). A-Area waste units are located in the Upper Three Runs and Savannah River/Floodplain Swamp Watersheds. Facilities and activities have a relatively low potential for offsite release of hazardous materials. The current designated land use for A Area is administrative and industrial.

Mission Description

A Area is primarily comprised of administrative, laboratory, industrial support, and some warehouse facilities. This part of the site functions as the primary entry point for visitors to the site. Most facilities were constructed in the early 1950s and many continue to provide adequate accommodations for their intended missions. However others presently require investment in maintenance and repair while still others are slated for deactivation and decommissioning.

The Savannah River National Laboratory (SRNL) is a major tenant in A Area. As part of research and development, it is likely that small quantities of the constituents used in site processes were used at SRNL at some time. Originally established to support the production of nuclear materials for national defense, SRNL plays a key role in advancing science and technology developments for defense applications. As a national center for technological innovations, SRNL facilities continue to support the national interest by providing the laboratory setting for technology advancements in waste vitrification, environmental remediation, robotics, and advanced sensor systems. SRNL laboratory buildings, constructed in 1953, have been effectively maintained throughout the history of SRNL. Modest infrastructure investments have been made recently to these buildings and have prepared them to support SRNL's current and future missions. However, the SRNL infrastructure is in relatively good shape and is prepared to support the enduring nature of the SRNL. SRNL provides critical nuclear research and support to the tritium, plutonium, and legacy wastes missions. For this reason, heightened security is provided for this facility.

Another major A-Area tenant is the Savannah River Ecology Laboratory (SREL), operated by the University of Georgia. Since 1951, SREL has conducted independent ecological research at SRS, which includes research on land and water use, land and water management, and the impact of SRS operation practices on the environment. A permanent ecology laboratory was established in 1961, and new laboratories and a new computer center were added in the 1990s. In addition to the laboratory, SREL operates three greenhouses, an animal care facility, an aquatic animal care facility, an avian housing facility, a distance learning facility, a series of small ponds, and various storage and maintenance buildings.

A Area is also the location of several critical 24-hour operations, including the Emergency Operations Center, SRNL Laboratory Operations, Records Storage, SRS Fire Department, and the Central Unclassified and Classified Computer Facilities.

Area Hazards

The conceptual site models for A-Area are provided in Figures 4.7b.1, *A-Area CSM for Upper Three Runs*, and 4.7b.2, *A-Area CSM for the Savannah River/Floodplain Swamp Watershed*, both located in Appendix J, *Area Conceptual Site Models and Hazard Tables*. These depict the potential sources of contamination, migration pathways, exposure media and potential receptors. Table 4.3a, *Alternative Planned End State by Areas*, located in Appendix J, *Area Conceptual Site Models and Hazard Tables*, provides a listing of the A-Area waste units with associated characteristics. With the exception of G-Area waste units previously discussed with the appropriate watershed, the

major hazards in A Area that require further evaluation and potential remediation are the SRL 904-A Process Trench, A-001 Outfall, A-Area Miscellaneous Rubble Pile, and the Miscellaneous Chemical Basin.

Area Cleanup Status

Table 4.3a, *SRS End State Vision Planned by Area*, provides the current remedial status for the A-Area waste units and the remedial technology implemented for completed units. For waste units in the "to go" phase where the response action has not been selected, Table 4.4a, *SRS End State Vision Hazard Type Crosswalk for Area 'To Go" Units* in Appendix J, *Area Conceptual Site Models and Hazard Tables*, depicts a crosswalk that categorizes each of the "to go" units to a hazard type CSM located in Appendix K, *Conceptual Site Models for Typical Hazards (Soil, Groundwater, EM Facilities, HLW Tanks)*. The hazard type CSMs list the remedial technologies likely to be implemented for each hazard type. The "to go" waste units will undergo characterization, risk analysis, and evaluation for the appropriate remedial technologies.

Remediation for 14 of the 31 A-Area waste units is complete (Table 4.3a, *SRS End State Vision Planned by Area)*. For the remaining 17 "to go" waste units, seven units are categorized as Hazard Type 9 (Miscellaneous Sites), six as Hazard Type 5 (Nonradiological Rubble Piles and Pits), three as Hazard Type 3 (Coal Pile Runoff Basins and Ash Basins), and one as Hazard Type 6 (Nonradiological Seepage Basins). Hazard sources to be evaluated for the remaining A-Area waste units include a variety of radioactive releases, nonradioactive rubble and building debris, organic and inorganic constituents.

Area Planned End State Hazards

The current and projected end state for A-Area waste units is to accommodate a final risk level of 10^{-4} to 10^{-6} with institutional controls for the industrial worker and below MCLs for groundwater.

Mission and Facility End State

The primary focus for facility end state in A Area includes a significant shutdown of A Area activities to shrink the infrastructure maintenance and operation requirements and consolidate and strengthen secure areas. Additional studies and characterization are needed to determine the level of shut down of A Area facilities before final decisions are made. These studies are needed once DOE decisions on future missions for SRS are made. Any additional consolidation of administrative areas would be located closer to the center of the site.

Essential infrastructure elements of SRNL technical area facilities will be maintained operable through 2025 to serve EM and National NNSA needs. The need by enduring DOE Programs for new, centralized facilities or a reduced footprint version of the current facilities would be assessed at that time. New missions are expected to provide any required, incremental research and development infrastructure. Any new SRNL facility would most likely be located in the central industrialized area of the site.

Site warehouse operations in A Area would not be necessary if the administrative and laboratory functions were relocated. Warehouse and maintenance operations in A Area could be consolidated in N Area. After the majority of employees have relocated to the center of the site, the steam requirements would be lessened, and use of the A-Area Powerhouse could be phased out.

SREL facilities are newer than most of the buildings in A Area and still have some useful life. As long as it is cost-effective to maintain infrastructure in A Area for SREL functions, SREL could remain in A Area. As the facilities in SREL near the end of their useful life, new administrative and laboratory facilities could be constructed near B Area outside the secure zone to allow public access. By 2026, according to the proposed reconfiguration scenario, no building in A Area would be in use, and all facilities would have been or about to begin transition to deactivation and decommissioning.

The SRS Cleanup Reform Vision is to demolish buildings and structures located in A Area by 2025. The only exceptions will preserve unique analytical capabilities of SRNL and provide a significantly reduced SREL footprint, composed of one or possibly two structures. In addition, buildings and facilities will be evaluated per the *Savannah River Site's Cold War Built Cultural Resources Management Plan* (CRMP) to determine their historic preservation status, as well as an evaluation for the local economic outreach initiative. Building 742-A is being designated as the SRS Heritage Center. The following buildings will be used for the local economic outreach initiative: 703-43A, 703-45A, 703-47A, 707-A, 717-10A, 721-12A, 724-16A, 733-1A, 740-1A, 740-8A, 743-1A, 745-A, 754-8A, and 763-A.

Below is a table showing the number of nuclear, radiological and industrial facilities in A Area. End states are shown as either demolished or in situ. This information is based on the *SRS EM D&D Plan*, which did not account for reuse by other federal facilities or economic development or for historic preservation.

A Area Totals			Current Status	End State	
Facility Haz Type	**No.**	**Sq Ft**	**Comp**	**Dem**	**ISD**
Nuc	8	325,544	0	8	0
Rad	0	0	0	0	0
Oth Ind	139	1,342,353	0	139	0
Total	147	1,667,897	0	147	0

Nuc- Nuclear
Rad – Radiological
Oth Ind – Other Industrial
No. – Number of facilities
Sq Ft – Square Feet
Comp – Complete
Dem – Demolished
ISD – In situ disposal

Table 4.3 A-Area D&D Table

NOTE: Information provided in this table is based on the *DOE/WSRC Contract No. DE-AC09-96R18500, Modification Number 100,* and *the Savannah River Site Environmental Management Integrated Deactivation and Decommissioning Plan*, Rev. 1, September 30, 2003. Current status is shown facilities completed as of the end of fiscal year 2003 (September 30, 2003).

4.4.2 B Area

Area Description

B Area is located approximately four miles from A Area, near the intersection of Road C and Road 2. It is comprised primarily of administrative, protective force operations, laboratory, and warehouse facilities. All B-Area waste units are located in the Upper Three Runs Watershed with the exception of one rubble pile located in the Savannah River/Floodplain Swamp Watershed.

Some B-Area facilities were constructed in the early 1950s and new administrative buildings were added in the 1990s. Modern administrative, laboratory and engineering facilities were recently constructed for information technology, environmental sciences, safety and health, project engineering and construction, and procurement personnel. The current land use designation for B Area is site industrial.

Mission Description

Many of the administrative staffs are currently located in B Area, including the DOE-SR Manager. Another major tenant in B Area is Wackenhut Services, Incorporated – Savannah River Site (WSI-SRS), which provides protective-force personnel to guard DOE security interests. SREL currently operates laboratories in B Area, adjacent to WSI-SRS.

Bordering B Area, in an area formerly called U Area, is the location of the former Heavy Water Components Test Reactor (HWCTR). The facility was a research and development reactor built in the 1960s and operated for only a few years. It was shut down permanently in 1967. The support buildings and structures have been demolished, and the only structure remaining is the reactor building. This building is a high-integrity steel containment structure that has been deactivated and welded shut, placing the facility into long-term safe storage.

Area Hazards

Although B Area is influenced by a topographic and hydrogeologic divide, only one conceptual site model is provided in Figures 4.8b, *B-Area CSM for Upper Three Runs Watershed* in Appendix I, *Watershed Conceptual Site Models and Hazard Tables*, depicting the potential sources of contamination, migration pathways, exposure media and potential receptors. There is one completed (no action) waste unit that resides in the Savannah River/Floodplain Swamp Watershed. Table 4.3.a, *SRS End State Vision Planned by Area* in Appendix J, *Area Conceptual Site Models and Hazard Tables*, provides a listing of the B-Area waste units with associated characteristics. G-Area waste units were discussed previously with the appropriate watershed. There are no major hazards in B Area that require remediation.

Area Cleanup Status

Table 4.3a, *SRS End State Vision Planned by Area*, provides the current remedial status for the B-Area waste units and the remedial technology implemented for completed units. For waste units in the "to go" phase where the response action has not been selected, Table 4.4a, *SRS End State Vision Hazard Type Crosswalk for Area 'To Go" Units*, depicts a crosswalk that categorizes each of the "to go" units" to a hazard type CSM located in Appendix K, *Conceptual Site Models for Typical SRS Hazards (Soil, Groundwater, EM Facilities, HLW Tanks)*. The hazard type CSMs list the remedial technologies likely to be implemented for each hazard type. The "to go" waste units will undergo characterization, risk analysis, and evaluation for the appropriate remedial technologies.

Remediation for 14 of the 17 B-Area waste units is complete (see Table 4.3). For the remaining three "to go" waste units, two units are categorized as Hazard Type 5 (Nonradiological Rubble Piles and Pits) and one unit as Hazard Type 9 (Miscellaneous Sites). Hazard sources to be evaluated for the remaining B-Area waste units include nonradioactive rubble and building debris, organic and inorganic constituents.

Area Planned End State Hazards

The current and projected end state for B-Area waste units is to accommodate a final risk level of 10^{-4} to 10^{-6} with institutional controls for the industrial worker.

Mission and Facility End State

Plans are for B Area to become a centralized site administrative complex. DOE-SR and WSRC administrative functions formerly located in A Area have been relocated to B Area, as new office space is made available to consolidate site administrative employees. A facility or facilities to accommodate site visitors and provide badging will also be constructed in B Area. This facility will be located outside of the secure area, and a security gatehouse will be located near to the B-Area functions to control public access to the site operations.

A new training facility may be constructed in B Area to move this administrative function out of the Heavy Industrial Zone. Locating the training function outside of the nuclear industrial area and closer to site boundaries would facilitate evacuation in the event of an emergency incident. This would also be a cost savings as a B-Area location would put the majority of site employees closer to the training facility. Support operations, such as fire protection and record storage, also will need to be constructed.

As the USDA United States Forest Service - Savannah River (USFS-SR) and SREL facilities near the end of their useful life, USFS-SR administrative and educational program functions and SREL administrative offices will be located in B Area. The USFS-SR will also maintain strategically placed fire protection equipment, engineering, and maintenance materials and equipment in B Area and elsewhere around the site. SREL administration will be located outside the secure area near the visitor's center and SREL will maintain laboratory and environmental monitoring facilities around the site, as needed.

In the absence of continuing mission area assignments, all facilities in B Area will be demolished by 2025, subject to an evaluation per the CRMP for historic preservation and the local economic outreach initiative.

Below is a table showing the number of nuclear, radiological and industrial facilities in B Area. End states are shown as either demolished or in situ. This information is based on the *SRS EM D&D Plan*, which did not account for reuse by other federal facilities or economic development or for historic preservation.

B and U Areas Totals			Current Status	End State	
Facility Haz Type	No.	Sq Ft	Comp	DEM	ISD
Nuc	0	0	0	0	0
Rad	0	0	0	0	0
Oth Ind	31	618,343	0	30	1
Total	31	618,343	0	30	1

Table 4.4 B-Area D&D Table

NOTE: Information provided in this table is based on the *DOE/WSRC Contract No. DE-AC09-96R18500, Modification Number 100*, and *the Savannah River Site Environmental Management Integrated Deactivation and Decommissioning Plan*, Rev. 1, September 30, 2003. Current status is shown facilities completed as of the end of fiscal year 2003 (September 30, 2003).

4.4.3 C Area

Area Description

C Area is comprised of nuclear industrial, light machining and administrative facilities. All C-Area waste units are located in the Fourmile Branch Watershed. The current land use for C Area is site industrial.

Mission Description

C Area is one of five SRS reactor areas with the original mission of producing material for the Department of Defense nuclear weapons program. The C-Area Reactor at SRS is inactive,

and the reactor building is being used as a Decontamination Center. Most facilities were originally constructed in the early 1950s and continue to provide adequate accommodations for their current missions.

C Reactor is a multiple-story facility that contained a heavy water moderated production reactor. The C Reactor Assembly Area, formerly used for the receipt, handling, and storage of new, unirradiated fuel and targets from the M-Area manufacturing area, currently houses the Site Decontamination Center. The disassembly area consists primarily of a water-filled basin with metal racks designed for vertical storage of fuel tubes and metal buckets for storing targets during operations. The basin contains several million gallons of water and in the past it allowed the target and fuel assemblies to undergo natural radioactive decay after neutron irradiation, usually over a period of 12 to 18 months. Currently, no irradiated or unirradiated fuel or targets are stored in the 105-C Disassembly Basin or Assembly Area. The ground level of C Reactor has been modified to serve as a central decontamination facility for radiologically contaminated operations and maintenance equipment. However, heavy water continues to be stored in the reactor building in the designated process tanks.

Area Hazards

The conceptual site model for C Area is provided in Figure 4.9b, *C-Area CSM for Fourmile Branch Watershed* in Appendix J, *Area Conceptual Site Models and Hazard Table*, and depicts the potential sources of contamination, migration pathways, exposure media and potential receptors. Table 4.3a, *SRS End State Vision Planned by Area*, provides a listing of the C-Area waste units with associated characteristics. With the exception of G-Area waste units previously discussed with the appropriate watershed, the major hazards in C Area that require further evaluation and potential remediation are the C-Area Disassembly Basin, C-Area Reactor Discharge Canal, Inactive Process Sewer Lines, C Reactor Area Cask Car Railroad Tracks, and C-Area Reactor Groundwater.

Area Cleanup Status

Table 4.3a, *SRS End State Vision Planned by Area*, also provides the current remedial status for the C-Area waste units and the remedial technology implemented for completed units. For waste units in the "to go" phase where the response action has not been selected, Table 4.4a, *SRS End State Vision Hazard Type Crosswalk for Area 'To Go" Units*, depicts a crosswalk that categorizes each of the "to go" units" to a hazard type CSM located in Appendix K, *Conceptual Site Models for Typical SRS Hazards (Soil, Groundwater, EM Facilities, HLW Tanks)*. The hazard type CSMs list the remedial technologies likely to be implemented for each hazard type. The "to go" waste units will undergo characterization, risk analysis, and evaluation for the appropriate remedial technologies.

Remediation for 20 of the 31 C-Area waste units is complete (see Table 4.3). For the remaining 11 "to go" waste units, two units are categorized as Hazard Type 2 (Radiological Seepage Basins and Pits), two units as Hazard Type 3 (Coal Pile Runoff Basins and Ash Basins), one unit as Hazard Type 4 (Inactive Process Sewer Lines), four units as Hazard Type 5 (Nonradiological Rubble Piles and Pits), one unit as Hazard Type 9 (Miscellaneous Sites), and one unit as Hazard Type 10 (Groundwater). Hazard sources to be evaluated for the remaining C-Area waste units include radionuclides, nonradioactive rubble and building debris, organic and inorganic constituents.

Remedial technologies for groundwater are presented with each Hazard Type CSM in Appendix K, *Conceptual Site Models for Typical*

SRS Hazards (Soil, Groundwater, EM Facilities, and HLW Tanks). C-Area Groundwater is the only C-Area groundwater waste unit in the "to go" phase. The groundwater pathways with impacted media and receptors are shown on Figure 4.9b, *C-Area CSM for Fourmile Branch Watershed*. A tritium plume, a TCE plume and a PCE plume were identified in C Area. Sources of the contamination have been identified within the C Reactor area perimeter fence. Tritium is related to the operation of the reactor itself and was released from numerous sources and spills. Characterization data indicates the tritium source is depleted. A TCE source was discovered near the assembly building and appears to be the source of the reactor TCE plume. The TCE source is considered to be a continuing source because of the residuals in the soil. In addition, tritium has been detected above MCLs in Fourmile Branch and its tributaries Caster Creek and Twin Lakes.

Area Planned End State Hazards

The current and projected end state for C-Area waste units is to accommodate a final risk level of 10^{-4} to 10^{-6} with institutional controls for the industrial worker and below MCLs for groundwater.

Mission and Facility End State

The reactor building, 105-C, once its decontamination mission is complete, will be saved for Cold War Historic Preservation. In addition, other reactor support buildings (106-C, 107-C, 108-1C, 108-2C, 109-C, 151-1C, 151-2C, 701-1C, 704-C, 706-C, 186-C, and 190-C) will also be preserved for historic preservation. All other hardened buildings will be demolished after being evaluated per the CRMP to determine their historic preservation status, as well as an evaluation for the local economic outreach initiative.

All non-hardened support buildings and administrative buildings will have been demolished. All temporary buildings and trailers would have been removed. The Disassembly Basin would have been decommissioned with an environmental cap installed. A fence around the perimeter of the remaining facilities will secure the 105-C complex.

Below is a table showing the number of nuclear, radiological and industrial facilities in C Area. End states are shown as either demolished or in situ. This information is based on the *SRS EM D&D Plan*, which did not account for reuse by other federal facilities or economic development or for historic preservation.

C Area Totals			Current Status	End State	
Facility Haz Type	No.	Sq Ft	Comp	DEM	ISD
Nuc	1	385,010	0	0	1
Rad	0	0	0	0	0
Oth Ind	24	389,915	0	17	7
Total	25	774,925	0	17	8

Table 4.5 C-Area D&D Table

NOTE: Information provided in this table is based on the *DOE/WSRC Contract No. DE-AC09-96R18500, Modification Number 100*, and *the Savannah River Site Environmental Management Integrated Deactivation and Decommissioning Plan*, Rev. 1, September 30, 2003. Current status is shown facilities completed as of the end of fiscal year 2003 (September 30, 2003).

4.4.4 D Area

Area Description

D Area is located 1.4 km (0.9 mi) east of the Savannah River on an upland terrace between Upper Three Runs to the north and Fourmile Branch to the south. The site is at an elevation

of 42.7 m (140 ft) above mean sea level. D-Area waste units are located in the Savannah River/Floodplain Swamp Watershed. The current land use for D Area is site industrial.

Mission Description

D-Area Heavy Water Facilities provided the heavy water necessary to moderate SRS's five nuclear reactors. D Area originally contained three sets of heavy water extraction towers with the support facilities needed to concentrate sufficient heavy water using the Savannah River as the water source. These original towers were operational until 1982. Since then, all three sets of extraction towers have been demolished with only the foundations remaining. The remaining heavy water rework facilities were shut down in 1998 and deactivated the following year. Facilities currently operating in D Area include a coal-fired power plant (leased by SRS to the South Carolina Electric and Gas Company [SCE&G]). Some non-power plant administrative and support facilities are being used in the short term but will soon become inactive (under surveillance and maintenance) and are scheduled for deactivation and decommissioning.

Area Hazards

The conceptual site model for D Area is provided in Figure 4.10b, *D Area CSM for Savannah River/Floodplain Swamp Watershed* in Appendix J, *Area Conceptual Site Models and Hazard Tables*, and depicts the potential sources of contamination, migration pathways, exposure media and potential receptors. *Table 4.3a, SRS End State Vision Planned by Area* in Appendix J, *Area Conceptual Site Models and Hazard Tables*, provides a listing of the D-Area waste units with associated characteristics. With the exception of G-Area waste units previously discussed with the appropriate watershed, the major hazards in D Area that require further evaluation and potential remediation are the 488-1D, 488-2D, and 488-4D Ash Basins and the D Area Groundwater Operable Unit.

Area Cleanup Status

Table 4.3a, *Alternative Planned End State by Areas*, provides the current remedial status for the D-Area waste units and the remedial technology implemented for completed units. For waste units in the "to go" phase where the response action has not been selected, *Table 4.4a, SRS End State Vision Hazard Type Crosswalk for Area 'To Go" Units*, depicts a crosswalk that categorizes each of the "to go" units" to a hazard type CSM located in Appendix K *Conceptual Site Models for Typical SRS Hazards (Soil, Groundwater, EM Facilities, HLW Tanks)*

The hazard type CSMs list the remedial technologies likely to be implemented for each hazard type. The "to go" waste units will undergo characterization, risk analysis, and evaluation for the appropriate remedial technologies.

Remediation for 15 of the 26 D-Area waste units is complete (Table 4.3). For the remaining 11 "to go" waste units, five units are categorized as Hazard Type 3 (Coal Pile Runoff Basins and Ash Basins), three units as Hazard Type 5 (Nonradiological Rubble Piles and Pits), three units as Hazard Type 9 (Miscellaneous Sites), and two unit as Hazard Type 10 (Groundwater). Hazard sources to be evaluated for the remaining D-Area waste units include nonradioactive rubble and building debris, organic and inorganic constituents.

Remedial technologies for groundwater are presented with each Hazard Type CSM in Appendix K, *Conceptual Site Models for Typical SRS Hazards (Soil, Groundwater, EM Facilities, and HLW Tanks)*. D-Area Groundwater Operable Unit is the only D-Area groundwater waste unit in the "to go" phase. The groundwater

pathways with impacted media and receptors are shown on Figure 4.10b, *D-Area CSM for Savannah River/Floodplain Swamp Watershed*. Low concentration and commingled tritium, TCE and inorganic plumes were identified in D Area. The TCE and tritium sources are thought to be depleted in the vadose zone. The inorganic plume sources have been identified and are, or will be, addressed. D-Area groundwater with contaminants above MCLs has the potential to impact the Savannah River Swamp and Savannah River. The groundwater investigation is entering the next phase to define the extent of the contaminant plumes.

Area Planned End State Hazards

The current and projected end state for D-Area waste units is to accommodate a final risk level of 10^{-4} to 10^{-6} with institutional controls for the industrial worker and below MCLs for groundwater.

Mission and Facility End State

The extraction towers have been demolished and every building and structure is scheduled for demolition including the coal-fired generating station, subject to evaluation per the CRMP for historic preservation and the local economic outreach initiative.

Below is a table showing the number of nuclear, radiological and industrial facilities in D Area. End states are shown as either demolished or in situ. This information is based on the *SRS EM D&D Plan*, which did not account for reuse by other federal facilities or economic development or for historic preservation.

D Area Totals			Current Status	End State	
Facility Haz Type	No.	Sq Ft	Comp	DEM	ISD
Nuc	0	0	0	0	0
Rad	2	14,867	0	2	0
Oth Ind	42	219,417	0	41	1
Total	44	234,284	0	43	1

Table 4.6 D-Area D&D Table

NOTE: Information provided in this table is based on the *DOE/WSRC Contract No. DE-AC09-96R18500, Modification Number 100*, and *the Savannah River Site Environmental Management Integrated Deactivation and Decommissioning Plan*, Rev. 1, September 30, 2003. Current status is shown facilities completed as of the end of fiscal year 2003 (September 30, 2003).

4.4.5 E Area

Area Description

E Area is located in the central part of SRS between the F and H-Area Separations Areas and is approximately 9.7 km (6 mi) from the plant boundary and covers approximately 330 acres. The current land use for E Area is site industrial.

Mission Description

E Area, which includes the Old Burial Ground, Mixed Waste Management Facility, TRU waste pads, and E-Area Vaults, receives low-level solid, TRU, and mixed waste from all site areas. E-Area facilities are maintained to manage previously received waste and to prepare for the receipt of waste from new site operations. Low-level waste is disposed in the E-Area Vaults or trenches. Transuranic (TRU) waste is characterized and made ready for shipment to the Waste Isolation Pilot Plant (WIPP) for ultimate disposal. The total inventory of TRU

waste in storage is currently over 8,000 cubic meters. This waste, some of which has been in storage since 1974, is contained in numerous packaging configurations including 55- and 83-gallon drums, concrete culverts and casks and large steel boxes. This waste contains ~680,000 curies. The primary isotopes are plutonium-239 and plutonium-238. The waste is physically stored on 22 concrete pads. Ten of these pads are enclosed and contain 55- and 83-gallon waste drums. Boxes, culverts and casks are stored on non-enclosed pads. Mixed waste is stored and will be sorted and segregated to allow waste to be readied for shipment to offsite treatment facilities.

The site recently began operations in support of the shipment of waste to WIPP. Initial operations are focused on relatively low activity 55-gallon drums of TRU waste. Facilities in operation include characterization/certification facilities (assay, x-ray, headspace gas analysis), both fixed and provided by mobile vendors, Visual Examination (VE) facilities and TRUPACT-II loading facilities, both fixed and mobile. Additional capabilities are also planned to prepare the highest of activity waste drums and all other containers including culverts, casks and steel boxes for disposal to WIPP.

Area Hazards

E Area is positioned on a topographic and hydrogeologic divide; therefore, two conceptual site models for E Area are provided in Figures 4.11b.1, *E-Area CSM Fourmile Branch Watershed* and 4.11b.2, *E-Area CSM for Upper Three Runs Watershed* in Appendix J, *Area Conceptual Site Models and Hazard Tables*, and depict the potential sources of contamination, migration pathways, exposure media and potential receptors. Table 4.3, *Alternative Planned End State by Areas*, provides a listing of the E-Area waste units with associated characteristics. With the exception of G-Area waste units previously discussed with the appropriate watershed, the major hazards in E Area that require further evaluation and potential remediation are the Old Radioactive Waste Disposal Facility (including Solvent Tanks), Low-Level Radioactive Waste Disposal Facility, and the Mixed Waste Management Facility (Groundwater).

Area Cleanup Status

Table 4.3a, *Alternative Planned End State by Areas*, provides the current remedial status for the E-Area waste units and the remedial technology implemented for completed units. For waste units in the "to go" phase where the response action has not been selected, Table 4.4a, *Alternative Hazard Type Crosswalk for Area "To Go" Units*, depicts a crosswalk that categorizes each of the "to go" units" to a hazard type CSM located in Appendix K, *Conceptual Site Models for Typical SRS Hazards (Soil, Groundwater, EM Facilities, HLW Tanks)*. The hazard type CSMs list the remedial technologies likely to be implemented for each hazard type. The "to go" waste units will undergo characterization, risk analysis, and evaluation for the appropriate remedial technologies.

Remediation for four of the seven E-Area waste units is complete (see Table 4.3a, *Alternative Planned End State by Areas*). For the remaining three "to go" waste units, two units are categorized as Hazard Type 1 (Burial Ground Complex) and one unit as Hazard Type 10 (Groundwater). Hazard sources to be evaluated for the remaining E-Area waste units include a variety of radioactive burials, nonradioactive rubble and building debris, organic and inorganic constituents.

Remedial technologies for groundwater are presented with each Hazard Type CSM in Appendix K, *Conceptual Site Models for Typical SRS Hazards (Soil, Groundwater, EM Facilities, and HLW Tanks*. The Mixed Waste Management Facility is the only E-Area groundwater waste

unit in the "to go" phase. The groundwater pathways with impacted media and receptors are shown on Figures 4.11b.1 and 4.11.2, *E-Area CSM for Four Mile Branch Watershed and E-Area CSM for Upper Three Runs, respectively*. Groundwater monitoring indicates several plumes emanating from the Burial Ground Complex. Including the Northwest, Northeast, Southwest, and Southeast Plumes. Groundwater contaminants identified in the Burial Ground Complex Groundwater include 1, 1-dichlorethylene, carbon tetrachloride, PCE, TCE, radium, tritium, and uranium-238. Contaminated groundwater outcrops along seep locations in Fourmile Branch.

Area Planned End State Hazards

The current and projected end state for E-Area waste units is to accommodate a final risk level of 10^{-4} to 10^{-6} with institutional controls for the industrial worker and below MCLs for groundwater.

Mission and Facility End State

All legacy TRU waste currently in storage will have been processed and shipped to WIPP for disposal or disposed of in alternative disposal facilities by the end of 2006. Facility operations would continue on a limited basis to process any newly generated waste not certifiable for direct shipment. However, because EM will not need any SRS facilities after 2025, they will be deactivated and decommissioned, primarily by in-situ disposal except for the Solid Waste Disposal Facility in E Area. Before demolishment, facilities will be evaluated per the CRMP for historic preservation and the local economic outreach initiative. A final remedy for a large portion of E Area containing the 200-acre Old Radioactive Waste Burial Ground – the highest risk posed by the 515 cleanup projects in the SRS Environmental Restoration Program – will be finished in 2008. It is likely low-level radioactive waste generated by SRS tenants or the Naval Nuclear Propulsion Program will continue to be buried within the Solid Waste Disposal Facility after 2025, but the volume will be extremely small. Hazardous, low-level, and radioactive mixed waste will be shipped directly to a commercial vendor for treatment and disposal. TRU will be shipped to New Mexico for geologic disposal. A perimeter fence will secure the remaining E-Area facilities.

Below is a table showing the number of nuclear, radiological and industrial facilities in E Area. End states are shown as either demolished or in situ. This information is based on the *SRS EM D&D Plan*, which did not account for reuse by other federal facilities or economic development or for historic preservation.

E Area Totals			Current Status	End State	
Facility Haz Type	No.	Sq Ft	Comp	DEM	ISD
Nuc	16	255,299	0	13	3
Rad	0	0	0	0	0
Oth Ind	7	24,040	0	6	1
Total	23	279,339	0	19	4

Table 4.7 E-Area D&D Table

NOTE: Information provided in this table is based on the *DOE/WSRC Contract No. DE-AC09-96R18500, Modification Number 100,* and *the Savannah River Site Environmental Management Integrated Deactivation and Decommissioning Plan*, Rev. 1, September 30, 2003. Current status is shown facilities completed as of the end of fiscal year 2003 (September 30, 2003).

4.4.6 F Area

Area Description

F Area primarily comprises heavy nuclear industrial, warehouse, and administrative facilities. F-Area waste units are located in the

Fourmile Branch and Upper Three Runs Watersheds. The current land use for F Area is site industrial.

Mission Description

F Area facilities include the F-Canyon Building, Depleted Uranium (DU) Processing Facility, FB-Line Facility, Metallurgical Facilities, Naval Fuels Building, Central Analytical Laboratory, the Mock-up/Fabrication Facility, medical facilities, and the F-Area Tank Farm. F Area is one of the two areas located near the center of SRS where nuclear chemical separations and waste management operations are performed. The primary function of these facilities is to stabilize special nuclear material (SNM) from spent fuels, irradiated targets, and other legacy nuclear materials and to evaporate and store the liquid high-level waste generated by these operations.

Chemical separation and purification of these materials is accomplished in facilities known as canyons. The canyons are supported by ancillary facilities that provide further chemical conversion, cold chemical feeds, or general facility services. F-Area Canyon and H-Area Canyon are the only two nuclear chemical processing and separations facilities in the DOE Complex. In 2003 DOE began to phase out the F-Area Canyon with deactivation expected to be completed by 2006. The remaining reprocessing needs will be met by the H-Area Canyon. .

High-level liquid waste evaporation and storage is accomplished in the F-Tank Farm (FTF). The purpose of FTF is to safely store and manage an inventory of approximately 15 million gallons (127 million curies) of liquid high-level radioactive waste in 20 underground storage tanks. This waste has accumulated from nuclear material production operations at the Savannah River Site.

These interim storage tanks were built underground to provide shielding from the intense radiation fields of the highly radioactive waste. Originally there were 22 of these waste storage tanks, but two have been emptied and operationally closed. The waste tanks range in volume between 750,000 gallons and 1.3 million gallons (each with systems for leak detection, liquid level monitoring, ventilation, combustible gas monitoring, temperature monitoring and cooling, and remote inspection).

In addition to the tanks, FTF also contains two evaporator systems, two control rooms, cooling water systems, waste transfer systems, and other support structures (offices, maintenance shops, equipment/material storage, etc.).

The former Naval Fuels facility in F Area has been deactivated and is safely maintained in a low-cost surveillance and maintenance mode. D&D activities are proceeding to remove this facility.

Area Hazards

F Area is positioned on a topographic and hydrogeologic divide; therefore, two conceptual site models for F Area are provided in Figures 4.12b.1, *F-Area CSM for Fourmile Branch Watershed* and 4.12b.2, *F-Area CSM for Upper Three Runs Watershed*, which depict the potential sources of contamination, migration pathways, exposure media and potential receptors.

Building 235-F contains residual plutonium oxide and neptunium oxide contamination in facilities that are no longer operable (Actinide Billet Line, Plutonium Fuel Form Facility and the Plutonium Experimental Facility). Further evaluation and potential remediation of this residual contamination hazards will occur in planning for its decommissioning and area closure.

Table 4.3a, *Alternative Planned End State by* Areas, provides a listing of the F-Area waste units with associated characteristics. With the exception of G-Area waste units previously discussed with the appropriate watershed, the major hazards in F Area that require further evaluation and potential remediation are the Combined Spills from 242-F, 643-G and 701-1F, F-Area Retention Basin, F-Area Tank Farm, and the F-Area Inactive Process Sewer Lines. In addition, the F&H-Area Hazardous Waste Management Facilities (HWMF) and the General Separations Western Groundwater Operable Unit are the two groundwater units in F Area with major hazards.

Area Cleanup Status

Table 4.3a, *Alternative Planned End State by Areas,* provides the current remedial status for the F-Area waste units and the remedial technology implemented for completed units. For waste units in the "to go" phase where the response action has not been selected, Table 4.4a, *Alternative Hazard Type Crosswalk for Area "To Go" Units,* depicts a crosswalk that categorizes each of the "to go" units" to a hazard type CSM located in Appendix K, *Conceptual Site Models for Typical SRS Hazards (Soil, Groundwater, EM Facilities, HLW Tanks)*. The hazard type CSMs list the remedial technologies likely to be implemented for each hazard type. The "to go" waste units will undergo characterization, risk analysis, and evaluation for the appropriate remedial technologies.

Remediation for 35 of the 64 F-Area waste units is complete (Table 4.3). For the remaining 29 "to go" waste units, two units are categorized as Hazard Type 2 (Radiological Seepage Basins and Pits), two units as Hazard Type 3 (Coal Pile Runoff Basins and Ash Basins), two units as Hazard Type 4 (Inactive Process Sewer Lines), 21 units as Hazard Type 9 (Miscellaneous Sites) and two units as Hazard Type 10 (Groundwater). Hazard sources to be evaluated for the remaining F-Area waste units include radionuclides, nonradioactive rubble and building debris, organic and inorganic constituents.

Remedial technologies for groundwater are presented with each Hazard Type CSM in Appendix K. The groundwater pathways with impacted media and receptors are shown on Figures 4.12b.1, *F-Area CSM for Fourmile Branch Watershed*, and 4.12b.2, *F-Area CSM for Upper Three Runs Watershed*. The F&H-Area HWMF and the General Separations Western Groundwater Operable Unit are the two remaining groundwater units in F-Area. Groundwater underlying the F-Area HWMF has been impacted by F-Area operations. Metals, nitrate, organics, tritium and other radionuclides are present above MCLs in the groundwater beneath the F-Area seepage basins. Sampling at seep locations indicates that contaminated groundwater continues to impact the Fourmile Branch IOU.

The General Separations Area (GSA) Western Groundwater Operable Unit (OU) encompasses approximately 1100 acres in the northwest portion of the General Separations areas and includes the previous F-Area Canyon Groundwater OU and the F-Area Tank Farm Groundwater OU. The boundaries of the Western Groundwater OU include the Upper Three Runs to the west and north; an unnamed tributary to Upper Three Runs Creek, the MWMF, and the Old Radioactive Waste Burial Ground to the east. Metals, VOCs, and radionuclides are present in the groundwater at levels that exceed MCLs. The plumes are migrating towards the Upper Three Runs Creek and may impact the Upper Three Runs IOU.

Area Planned End State Hazards

The current and projected end state for F-Area waste units is to accommodate a final risk level of 10^{-4} to 10^{-6} with institutional controls for the

industrial worker and below MCLs for groundwater.

Mission and Facility End State

F Canyon, FB Line, and ancillary facilities will be decommissioned by in-situ disposal. The 235-F facility will remain operable through 2009 in support of the plutonium surveillance mission. At that time, the 235-F facility will be deactivated and decommissioned by in situ disposal and any remaining administrative facilities in F Area would be demolished or made available for reuse by another DOE or federal program.

All HLW Tanks in FTF will have been closed (removed from service and filled with grout). In addition, the 1F and 2F Evaporators and contaminated waste transfer systems would have been closed by isolating utilities and filling with grout. All above-ground buildings or structures will be demolished, and a perimeter fence will secure the remaining F Area facilities.

Before in situ disposal or demolition of any facilities, they will be evaluated per the CRMP for historic preservation and the local economic outreach initiative. The following buildings have already been identified for the local economic outreach initiative: 709-4F and 709-5F.

Below is a table showing the number of nuclear, radiological and industrial facilities in F Area. End states are shown as either demolished or in situ. This information is based on the *SRS EM D&D Plan*, which did not account for reuse by other federal facilities or economic development or for historic preservation.

F Area Totals			Current Status	End State	
Facility Haz Type	No.	Sq Ft	Comp	DEM	ISD
Nuc	36	698,359	0	29	7
Rad	10	200,924	0	8	2
Oth Ind	93	382,010	0	91	2
HLW Tanks	22	N/A	2	0	22
Total	161	1,281,293	2	128	33

Table 4.8 F-Area D&D Table

NOTE: Information provided in this table is based on the *DOE/WSRC Contract No. DE-AC09-96R18500, Modification Number 100*, and *the Savannah River Site Environmental Management Integrated Deactivation and Decommissioning Plan*, Rev. 1, September 30, 2003. Current status is shown facilities completed as of the end of fiscal year 2003 (September 30, 2003).

4.4.7 G Area

Mission Description

G Area is the area outside of site process areas, encompassing over 95 percent of the site. This area includes USFS-SR facilities, a rail network, Research Set-Aside Areas supporting the National Environmental Research Park (NERP), habitat and forest management areas, environmental monitoring activities, and facilities to support subcontractors. The developed portions of G Area primarily are comprised of light industrial, warehouse, and administrative facilities.

Information on area hazards, cleanup status, and planned end states can be found in the Watershed discussions in Section 4.3, Hazard Specific Discussion by Watersheds.

Mission and Facility End State

There are no new major facilities planned for G Area. Under the proposed reconfiguration, by 2020, the USFS-SR administrative and educational program functions could be located to new facilities in B Area. In addition to the facilities in B Area, the USFS-SR would also maintain strategically placed fire protection equipment and maintenance materials and equipment elsewhere around the site. The USFS-SR buildings currently located in G Area would be removed, subject to an evaluation per the CRMP for historic preservation and the local economic outreach initiative. Building 647-G has already been identified for the local economic outreach initiative. This information is based on the *SRS EM D&D Plan*, which did not account for reuse by other federal facilities or economic development or for historic preservation.

G Area Totals			Current Status	End State	
Facility Haz Type	No.	Sq Ft	Comp	DEM	ISD
Nuc	0	0	0	0	0
Rad	0	0	0	0	0
Oth Ind	102	249,480	0	88	14
Total	102	249,480	0	88	14

Table 4.9 G-Area D&D Table

NOTE: Information provided in this table is based on the *DOE/WSRC Contract No. DE-AC09-96R18500, Modification Number 100*, and *the Savannah River Site Environmental Management Integrated Deactivation and Decommissioning Plan*, Rev. 1, September 30, 2003. Current status is shown facilities completed as of the end of fiscal year 2003 (September 30, 2003).

4.4.8 H Area

Area Description

H Area is primarily comprised of heavy nuclear industrial, warehouse, and administrative facilities. H-Area waste units are located in the Fourmile Branch and Upper Three Runs Watersheds. The current land use for H Area is site industrial.

Mission Description

H Area is the second of the two nuclear chemical separation areas at SRS. H-Area facilities (H Canyon and HB Line) are used to stabilize nuclear materials. H Outside Facilities, which is adjacent to H Canyon/HB Line, supports separation processes by providing bulk chemical storage, liquid waste disposal, and nuclear material storage.

DOE plans to phase out its reprocessing capabilities and use of the canyons but must balance this closure with the need to stabilize fissile materials. Implementation of the 1992 decision by the Secretary of Energy to phase out canyon operations at SRS is proceeding with the use of the canyons limited to stabilizing certain deteriorating SNF, plutonium compounds, and other nuclear materials to forms suitable for safe and secure, long-term storage or disposition. After the H-Area Canyon/HB-Line processing commitments are completed, they will be deactivated.

The current missions of the H-Area Canyon include dissolution of Mark-16/22 and other SNF, dissolution of plutonium and enriched uranium residues, conversion of plutonium-239 and neptunium-237 to oxide, and blenddown of highly-enriched uranium solution to allow a low enrichment uranium solution of five percent enrichment to support the Tennessee Valley Authority (TVA) program for commercial power reactor fuel.

H Area also houses the Receiving Basin for Offsite Fuels (RBOF), which has been deinventoried.

High-level liquid radioactive waste is stored, evaporated, and pretreated for vitrification in H Area. The HLW facilities consist of the portion of this area know as H-Tank Farm (HTF). The purpose of the HTF Facility is to safely store and manage an inventory of approximately 23 million gallons (273 million curies) of liquid high-level radioactive waste in 29 underground storage tanks and to pre-treat the sludge portion of this waste to enable final processing at DWPF. This waste has accumulated from nuclear material production operations at SRS. These interim storage tanks were built underground to provide shielding from the intense radiation fields of the highly radioactive waste. All 23 of these tanks are currently in use. The waste tanks range in volume between 750,000 gallons and 1.3 million gallons (each with systems for leak detection, liquid level monitoring, ventilation, combustible gas monitoring, temperature monitoring and cooling, and remote inspection).

In addition to the tanks, HTF also contains three evaporator systems, three control rooms, waste pre-treatment buildings, cooling water systems, waste transfer systems, and other support structures (offices, maintenance shops, equipment/material storage, etc.).

The Consolidated Incineration Facility (CIF), also located in H Area, was designed and constructed to thermally treat and reduce the volume of low-level hazardous and mixed wastes. The CIF is currently shutdown and is maintained under a minimum surveillance and maintenance regimen.

The Effluent Treatment Project (ETP) collects and treats low-level radioactively and chemically contaminated wastewater from the HLW Program and the Nuclear Materials Management Program by removing chemical and radioactive contaminants before discharging the water.

Activities for the Defense Program, tritium extraction and recycle, also occur in H Area. The Tritium Facilities consists of four main buildings. Three of these, buildings 232-H, 234-H, and 238-H, have operated for many years. These buildings are the second generation tritium structures built onsite, and they house a number of key operations, including reclamation of previously used tritium reservoirs; receipt, packaging and shipping of reservoirs; recycling and enrichment of tritium gas; and several key laboratory and maintenance shop areas.

In 1994, tritium operations began in the newest structure, 233-H, which was referred to as the Replacement Tritium Facility during construction. Operations conducted in this building include unloading gases from reservoirs returned from the Department of Defense, separating and purifying the useful hydrogen isotopes (tritium and deuterium), mixing the gases to exact specifications, loading the reservoirs, and performing various reservoir performance tests (e.g., function testing, environmental conditioning).

The Tritium Facility Modernization and Consolidation (TFM&C) Project relocated several existing process systems and equipment, as well as laboratory functions. The TFM&C modifications provide sufficient processing capability and capacity to support the Tritium Extraction Facility. Other processes or laboratory facilities include the environmental storage and metallurgical operations.

Following completion of TFM&C, Building 232-H began a yearlong deactivation process in accordance with DOE Order 430.1B, *Real Property Asset Management*. This building will remain in long-term surveillance and maintenance until after 2025 to allow tritium

contamination to decay sufficiently for safe demolition. The half-life of tritium is 12.3 years.

The Tritium Extraction Facility (TEF), which has been designed for a 40-year operating life, will provide the capability to receive Tritium-Producing Burnable Absorber Rods from the Tennessee Valley Authority reactor at Watts Barr, Tennessee, and extract tritium-containing gases.

Other H-Area facilities include medical, warehouse, and training facilities. H-Area warehouse facilities provide material coordination, acquisition, and processing for numerous SRS operations; and their conditions vary from poor to good.

Area Hazards

H Area is positioned on a topographic and hydrogeologic divide; therefore, two conceptual site models for H-Area are provided in Figures 4.13b.1, *H-Area CSM for Fourmile Branch Watershed*, and 4.13b.2, *H-Area CSM for Upper Three Runs Watershed*, which depict the potential sources of contamination, migration pathways, exposure media and potential receptors. Table 4.3a, *Alternative Planned End State by Areas*, provides a listing of the H-Area waste units with associated characteristics. With the exception of G-Area waste units previously discussed with the appropriate watershed, the major hazards in H Area that require further evaluation and potential remediation are the H-Area Retention Basins, H-Area Process Sewer Lines, H-Area Inactive Process Sewer Lines, Warner's Pond, H-Area Retention Basin, HP-52 Ponds, and the General Separations Area Eastern Groundwater Operable Unit.

Area Cleanup Status

Table 4.3a, *Alternative Planned End State by Areas*, provides the current remedial status for the H-Area waste units and the remedial technology implemented for completed units. For waste units in the "to go" phase where the response action has not been selected, Table 4.4a, *Alternative Hazard Type Crosswalk for Area "To Go" Units*, depicts a crosswalk that categorizes each of the "to go" units" to a hazard type CSM located in Appendix K, *Conceptual Site Models for Typical SRS Hazards (Soil, Groundwater, EM Facilities, HLW Tanks*. The hazard type CSMs list the remedial technologies likely to be implemented for each hazard type. The "to go" waste units will undergo characterization, risk analysis, and evaluation for the appropriate remedial technologies.

Remediation for 19 of the 54 H-Area waste units is complete (Table 4.3). For the remaining 35 "to go" waste units, seven units are categorized as Hazard Type 2 (Radiological Seepage Basins and Pits), two units as Hazard Type 3 (Coal Pile Runoff Basins and Ash Basins), two units as Hazard Type 4 (Inactive Process Sewer Lines), 23 units as Hazard Type 9 (Miscellaneous Sites) and one unit as Hazard Type 10 (Groundwater). Hazard sources to be evaluated for the remaining H-Area waste units include radionuclides, nonradioactive rubble and building debris, organic and inorganic constituents.

Remedial technologies for groundwater are presented with each Hazard Type CSM in Appendix K, *Conceptual Site Models for Typical SRS Hazards (Soil, Groundwater, EM Facilities, and HLW Tanks*. The groundwater pathways with impacted media and receptors are shown on Figures 4.13b.1, *H-Area CSM for Fourmile Branch Watershed,* and 4.13b.2, *H-Area CSM for Upper Three Runs Watershed*. The General Separations Area (GSA) Eastern Groundwater OU is the only groundwater unit in H-Area that has not completed remediation. The GSA Eastern Groundwater OU includes the previous groundwater systems associated with the H-Area Tank Farm Groundwater OU and other operating facilities and waste units. Metals, VOCs, and radionuclides are present in the

Eastern Groundwater OU at levels that exceed MCLs. However, these exceedances are sporadic and localized and no definable plumes appear to emanate from a single operating facility or waste unit.

Area Planned End State Hazards

The current and projected end state for H-Area waste units is to accommodate a final risk level of 10^{-4} to 10^{-6} with institutional controls for the industrial worker and below MCLs for groundwater.

Mission and Facility End State

Subject to a review per the CRMP for historic preservation and for the local economic outreach initiative, H Canyon, HB Line, the Receiving Basin for Offsite Fuels and ancillary facilities will be deactivated before in-situ disposal. In-situ disposal of the HLW tanks means that empty tanks will be removed from service and filled with grout. In addition, the 1H, 2H, and 3H Evaporators and contaminated waste transfer systems will be decommissioned by isolating the equipment from all utilities before the evaporators are stabilized structurally with grout. All above-ground buildings including the Consolidated Incinerator Facility and Effluent Treatment Facility will be demolished. A perimeter fence will secure the remaining H Area facilities.

NNSA will decide whether tritium processing operations will continue at SRS after 2025.

Below is a table showing the number of nuclear, radiological and industrial facilities in H Area. End states are shown as either demolished or in situ. This information is based on the *SRS EM D&D Plan*, which did not account for reuse by other federal facilities or economic development or for historic preservation.

H Area Totals			Current Status	End State	
Facility Haz Type	No.	Sq Ft	Comp	DEM	ISD
Nuc	52	461,958	0	37	15
Rad	20	263,835	0	16	4
Oth Ind	93	431,672	0	87	6
HLW Tanks	29	N/A	0	0	29
Total	194	1,157,465	0	140	54

Table 4.10 H-Area D&D Table

NOTE: Information provided in this table is based on the *DOE/WSRC Contract No. DE-AC09-96R18500, Modification Number 100*, and *the Savannah River Site Environmental Management Integrated Deactivation and Decommissioning Plan*, Rev. 1, September 30, 2003. Current status is shown facilities completed as of the end of fiscal year 2003 (September 30, 2003).

4.4.9 K Area

Area Description

K Area is a 3,558 acre area with all K-Area waste units located in the Pen Branch Watershed. The current land use for K Area is site industrial.

Mission Description

K Area is one of five SRS reactor areas with the original mission of producing material for the Department of Defense nuclear weapons program. K Reactor is similar in size and layout to the other reactor areas. The K-Area production reactor is in shutdown condition with no capability of restart. The K-Area Disassembly Basin has been deinventoried and deactivated. K Area also serves to temporarily receive and store plutonium, highly-enriched uranium fuel, and large amounts of tritiated heavy water consolidated from other facilities. K Area is primarily comprised of heavy nuclear

industrial, administrative, safeguards and security, and some warehouse facilities.

Current K-Area activities include all programmatic and physical support efforts related to safe storage of Special Nuclear Materials (SNM) already referenced and from 235-F and FB-Line and offsite sources. K Area is being used temporarily to store plutonium, Highly Enriched Uranium, and large volume of heavy water that has been contaminated by tritium.

Facility modifications have been completed to allow receipt and storage of plutonium in K Area. The modifications facilitate the early deinventory and shut down of the Rocky Flats Environmental Technology Site (RFETS) to avoid an estimated $1.3 billion in operating costs. The K-Area facility is currently designed to store up to 5,000 containers and is being used temporarily to store plutonium, highly enriched uranium, and a large volume of heavy water that has been contaminated with tritium. All surplus fissile material and tritiated heavy water will be dispositioned. This material will be dispositioned by 2020. Presently, 10 K-Area facilities have been declared inactive.

Area Hazards

The conceptual site model for K Area is provided in Figure 4.14b, *K-Area CSM for Pen Branch Watershed* in Appendix J, *Area Conceptual Site Models and Hazard Tables,* and depicts the potential sources of contamination, migration pathways, exposure media and potential receptors. *Table 4.3a, SRS End State Vision Planned by Area* in Appendix J, *Area Conceptual Site Models and Hazard Tables,* provides a listing of the K-Area waste units with associated characteristics. With the exception of G-Area waste units previously discussed with the appropriate watershed, the major hazards in K Area that require further evaluation and potential remediation are the K-Area Disassembly Basin, K-Area Reactor Discharge Canal, K-Reactor Area Cask Car Railroad Tracks, and K-Area Reactor Groundwater.

Area Cleanup Status

Table 4.3a, *Alternative Planned End State by Areas,* provides the current remedial status for the K-Area waste units and the remedial technology implemented for completed units. For waste units in the “to go” phase where the response action has not been selected, Table 4.4a, *Alternative Hazard Type Crosswalk for Area "To Go" Units,* depicts a crosswalk that categorizes each of the “to go” units” to a hazard type CSM located in Appendix K. The hazard type CSMs list the remedial technologies likely to be implemented for each hazard type. The “to go” waste units will undergo characterization, risk analysis, and evaluation for the appropriate remedial technologies.

Remediation for 18 of the 26 K-Area waste units is complete (Table 4.3). For the remaining eight “to go” waste units, three units are categorized as Hazard Type 2 (Radiological Seepage Basins and Pits), one unit as Hazard Type 3 (Coal Pile Runoff Basins and Ash Basins), one unit as Hazard Type 5 (Nonradiological Rubble Piles and Pits), one unit as Hazard Type 7 (Sludge Application Sites), one unit as Hazard Type 9 (Miscellaneous Sites), and one unit as Hazard Type 10 (Groundwater). Hazard sources to be evaluated for the remaining K-Area waste units include radionuclides, nonradioactive rubble and building debris, organic and inorganic constituents.

Remedial technologies for groundwater are presented with each Hazard Type CSM in Appendix K, *Conceptual Site Models for Typical SRS Hazards (Soil, Groundwater, EM Facilities, and HLW Tanks*. K-Area groundwater is the only K-Area groundwater waste unit in the “to go” phase. The groundwater pathways with impacted media and receptors are shown on

Figure 4.14b, *K-Area CSM for Pen Branch Watershed*. Tritium and organics plumes have been identified to date, but groundwater characterization has not been completed, and a complete list of contaminants has not been completed. The K-Area Tritium Anomaly (previously Waste Unit 90) was combined with K-Area Groundwater. The anomaly was identified during quarterly groundwater sampling in 1990 by significant increases in tritium in seepage basin wells. Based on modeling predictions, groundwater from K-Area flows to Indian Grave Branch and Pen Branch where it discharges to the streams. There is the potential that contaminated groundwater impacts the Pen Branch IOU.

Area Planned End State Hazards

The current and projected end state for K-Area waste units is to accommodate a final risk level of 10^{-4} to 10^{-6} with institutional controls for the industrial worker and below MCLs for groundwater.

Mission and Facility End State

Following plutonium deinventory (approximately 2020), the 105-K Building and associated facilities would begin deactivation unless turned over to another Lead Program Secretarial Office for further use. However, prior to this time, there will be some K Area facilities, not associated with the Special Nuclear Materials Program, which will have been decommissioned.

All surplus fissile material and tritiated heavy water will be dispositioned. By 2025 all hardened reactor facilities will be decommissioned by in-situ disposal and all non-hardened buildings and structures in K Area will be demolished. A perimeter fence will secure the remaining K Area facilities.

Before any facilities are dispositioned, demolished, or in situ disposed, they will be evaluated per the CRMP for historic preservation and for the local economic outreach initiative.

Below is a table showing the number of nuclear, radiological and industrial facilities in K Area. End states are shown as either demolished or in situ. This information is based on the *SRS EM D&D Plan*, which did not account for reuse by other federal facilities or economic development or for historic preservation. This information is based on the *SRS EM D&D Plan*, which did not account for reuse by other federal facilities or economic development or for historic preservation.

K Area Totals			Current Status	End State	
Facility Haz Type	No.	Sq Ft	Comp	DEM	ISD
Nuc	2	388,326	0	1	1
Rad	0	0	0	0	0
Oth Ind	32	447,398	0	23	9
Total	34	835,724	0	24	10

Table 4.11 K-Area D&D Table

NOTE: Information provided in this table is based on the *DOE/WSRC Contract No. DE-AC09-96R18500, Modification Number 100*, and *the Savannah River Site Environmental Management Integrated Deactivation and Decommissioning Plan*, Rev. 1, September 30, 2003. Current status is shown facilities completed as of the end of fiscal year 2003 (September 30, 2003).

4.4.10 L Area

Area Description

L Area is an upland site region between Steel Creek and Pen Branch located approximately 1.9 miles southwest of the geographical center of SRS and about 6 miles northwest of the nearest site boundary. L-Area waste units are located in

both the Steel Creek and the Pen Branch Watersheds. The current land use for L Area is site industrial.

Mission Description

L Area is one of five SRS reactor areas with the original mission of producing material for the Department of Defense nuclear weapons program. The area is similar in size and layout to the other reactor areas. The L-Area production reactor is in shutdown condition with no capability of restart. However, the L-Area Disassembly Basin currently plays a crucial role in DOE's Spent Nuclear Fuel (SNF) mission.

Irradiated fuel assemblies have been stored in the disassembly basins since discharge from the reactors. Additional SNF is being, and will be, received and stored at SRS from offsite domestic and foreign research reactors, with offsite SNF receipts projected through the year 2019. L Area also provided space for consolidation of the D-Area Heavy Water. L Area is primarily comprised of heavy nuclear industrial, administrative, safeguards and security, and some warehouse facilities.

Current L-Area activities include programmatic and physical support related to receipt and safe storage of SNF, shipments of irradiated fuel to the canyons to complete the basin deinventory, future stabilization of SNF, and heavy water storage. SNF activities help manage the wet basin storage of SNF inventories to allow receipt of projected shipments and provide safe storage until a new treatment and dry storage facility is available.

Presently, eight L-Area facilities have been declared inactive.

Area Hazards

L-Area is positioned on a topographic and hydrogeologic divide; therefore, two conceptual site models for L-Area are provided in Figures 4.15b.1, *L-Area CSM for Pen Branch Watershed*, and 4.15b.2, *L-Area CSM for Steel Creek Watershed*, depicts the potential sources of contamination, migration pathways, exposure media and potential receptors. Table 4.3a, *Alternative Planned End State by Areas*, provides a listing of the L-Area waste units with associated characteristics. With the exception of G-Area waste units previously discussed with the appropriate watershed, the major hazards in L Area that require further evaluation and potential remediation are the L-Reactor Area Cask Car Railroad Tracks, L-Area Hot Shop, and L-Area Southern Groundwater.

Area Cleanup Status

Table 4.3a, *Alternative Planned End State by Areas*, provides the current remedial status for the L-Area waste units and the remedial technology implemented for completed units. For waste units in the "to go" phase where the response action has not been selected, Table 4.4a, *Alternative Hazard Type Crosswalk for Area "To Go" Units*, depicts a crosswalk that categorizes each of the "to go" units" to a hazard type CSM located in Appendix K, *Conceptual Site Models for Typical Hazards*. The hazard type CSMs list the remedial technologies likely to be implemented for each hazard type. The "to go" waste units will undergo characterization, risk analysis, and evaluation for the appropriate remedial technologies.

Remediation for 17 of the 28 L-Area waste units is complete (Table 4.3). For the remaining 11 "to go" waste units, two units are categorized as Hazard Type 2 (Radiological Seepage Basins and Pits), one unit as Hazard Type 3 (Coal Pile Runoff Basins and Ash Basins), four units as Hazard Type 5 (Nonradiological Rubble Piles and Pits), two units as Hazard Type 9 (Miscellaneous Sites), and two units as Hazard Type 10 (Groundwater). Hazard sources to be evaluated for the remaining L-Area waste units include radionuclides, nonradioactive rubble and

building debris, organic and inorganic constituents.

Remedial technologies for groundwater are presented with each Hazard Type CSM in Appendix K, *Conceptual Site Models for Typical Hazards*. L-Area Southern Groundwater and L-Area Northern Groundwater are the L-Area groundwater waste units in the "to go" phase. The groundwater pathways with impacted media and receptors are shown on Figures 4.15b.1, *L-Area CSM for Pen Branch Watershed*, and 4.15b.2, *L-Area CSM for Steel Creek Watershed.*

The L-Area Southern Groundwater OU encompasses all the groundwater south of L Reactor to L Lake. The L-Area Northern Groundwater has yet to be investigated. The L-Area Southern Groundwater OU investigation has identified groundwater contaminated with TCE, PCE, and tritium. Two distinct commingled plumes of tritium, TCE, and PCE exist south of the reactor and extend toward L Lake. Characterization data indicate that areas within the reactor perimeter fence are contributing sources to the plumes. A separate tritium plume exists to the west of the reactor area and is moving in a westward direction between Pen Branch and L Lake. Initial characterization and modeling indicate that the source of this plume is a retention basin located west of the reactor facility. Steel Creek is a gaining stream above L Lake and may be impacted by contaminated groundwater. The groundwater investigation is entering the next phase to define the extent of the contaminant plumes and results will be evaluated with regards to IOU impact in the next periodic report.

Area Planned End State Hazards

The current and projected end state for L-Area waste units is to accommodate a final risk level of 10^{-4} to 10^{-6} with institutional controls for the industrial worker and below MCLs for groundwater.

Mission and Facility End State

If EM is the programmatic owner of the L-Area facilities; the plan is to complete deinventory by the end of 2020 and deactivation by the end of 2022. By 2025 all hardened reactor facilities will be decommissioned by in-situ disposal and all non-hardened buildings and structures in L Area will be demolished. A perimeter fence will secure the remaining L Area facilities. Revised schedules and plans would be formulated if the facilities are turned over to a non-EM government entity, and the facility scope and lifecycle baseline plan changes.

Before any facilities are dispositioned, demolished, or in situ disposed, they will be evaluated per the CRMP for historic preservation and for local economic outreach initiative.

Below is a table showing the number of nuclear, radiological and industrial facilities in L Area. End states are shown as either demolished or in situ. This information is based on the *SRS EM D&D Plan*, which did not account for reuse by other federal facilities or economic development or for historic preservation.

L Area Totals			Current Status	End State	
Facility Haz Type	No.	Sq Ft	Comp	DEM	ISD
Nuc	1	385,010	0	0	1
Rad	1	4,087	0	1	0
Oth Ind	28	272,866	0	22	6
Total	30	661,963	0	23	7

Table 4.12 L-Area D&D Table

NOTE: Information provided in this table is based on the *DOE/WSRC Contract No. DE-AC09-96R18500, Modification Number 100*, and

the Savannah River Site Environmental Management Integrated Deactivation and Decommissioning Plan, Rev. 1, September 30, 2003. Current status is shown facilities completed as of the end of fiscal year 2003 (September 30, 2003).

4.4.11 M Area

Area Description

M Area is located in the northwest part of SRS and is approximately one mile from the plant boundary and covers approximately 50 acres. D&D operations are currently being undertaken in M Area. M- Area waste units are located in the Upper Three Runs and Savannah River/Floodplain Swamp Watersheds. The current land use designation for M Area is site industrial.

Mission Description

M Area formerly manufactured nuclear fuel and target elements for use in the production reactors. M Area housed materials fabrication facilities to support reactor operations, similar to structures found in non-nuclear metal and finishing operations, and produced special fuel assemblies containing targets for the production of special nuclear materials. The area is composed of three large fuel and target facilities, two laboratories, a wastewater treatment facility, a low-level waste vitrification facility, and numerous support facilities. Residual contamination exists in most of these facilities, a legacy of past operations. Both laboratories have been deactivated as well as several other facilities. Deactivation of the wastewater treatment and the low-level waste vitrification facilities were completed in 2001.

Area Hazards

The conceptual site models for M-Area are provided in Figures 4.16b.1, *M-Area CSM for Upper Three Runs Watershed,* and 4.16b.2, *M-Area CSM for Savannah River/Floodplain Swamp Watershed,* and depict the potential sources of contamination, migration pathways, exposure media and potential receptors. Table 4.3a, *Alternative Planned End State by Areas,* provides a listing of the M-Area waste units with associated characteristics. With the exception of G-Area waste units previously discussed with the appropriate watershed, the major hazards in M Area that require further evaluation and potential remediation are the M-Area Settling Basin Inactive Process Sewers to Manhole 1, Underground Sumps 321 M #001 and 321 M #002, 313-M and 320-M Inactive Clay Process Sewers to Tims Branch, Spill on 12/01/71 of 1,000 gallons of radioactive water from 773-A, M-Area Hazardous Waste Management Facility: A/M Area Groundwater Portion (Groundwater), and Savannah River Laboratory (SRL) Groundwater (Groundwater).

Area Cleanup Status

Table 4.3a, Alternative *Planned End State by Areas,* provides the current remedial status for the M-Area waste units and the remedial technology implemented for completed units. For waste units in the “to go” phase where the response action has not been selected, Table 4.4a, *Alternative Hazard Type Crosswalk for Area "To Go" Units*, depicts a crosswalk that categorizes each of the “to go” units” to a hazard type CSM located in Appendix K, *Conceptual Site Models for Typical Hazards*. The hazard type CSMs list the remedial technologies likely to be implemented for each hazard type. The “to go” waste units will undergo characterization, risk analysis, and evaluation for the appropriate remedial technologies.

Remediation for 45 of the 53 M-Area waste units is complete (Table 4.3). For the remaining 8 “to go” waste units, five units are categorized as Hazard Type 4 (Inactive Process Sewer Lines), one as Hazard Type 9 (miscellaneous sites) and two as Hazard Type 10 (groundwater).

Hazard sources to be evaluated for the remaining M-Area waste units include a variety of radioactive releases, nonradioactive rubble and building debris, organic and inorganic constituents.

Remedial technologies for groundwater are presented with each Hazard Type CSM in Appendix K, *Conceptual Site Models for Typical SRS Hazards (Soil, Groundwater, EM Facilities, and HLW Tanks*. The groundwater pathways with impacted media and receptors are shown on Figures 4.16b.1b, *M-Area CSM for Upper Three Runs Watershed*, and 4.16b.2, *M-Area CSM for Savannah River/Floodplain Swamp Watershed*. The M-Area Hazardous Waste Management Facility: A/M Area Groundwater Portion and SRL Groundwater are the two remaining groundwater units in M Area. These groundwater plumes are commingled and encompass approximately three square miles. This groundwater contamination underlies a large portion of A/M Area, but it is presented here in the M-Area discussion to avoid repetition. Groundwater associated with the M-Area Hazardous Waste Management Facility: A/M Area Groundwater Portion has been impacted by A/M-Area operations. VOC contamination (trichloroethylene, perchloroethylene, and 1,1,1-trichloroethane) is present above MCLs in this groundwater unit.

The SRL Groundwater OU addresses contaminated groundwater beneath SRNL (formerly SRL) complex. Operations in research and laboratory facilities within the complex resulted in the release of contaminants (including volatile organic compounds [VOCs] and radionuclides above MCLs) to the subsurface. This groundwater plume extends towards Tims Branch beneath the unnamed tributary located east of A Area. There is no indication at this time that the plume has impacted surface water.

The remediation program for both groundwater units includes a series of soil vapor extraction units, a network of recovery and recirculation wells, and innovative remedial technologies.

Area Planned End State Hazards

The current and projected end state for M-Area waste units is to accommodate a final risk level of 10^{-4} to 10^{-6} with institutional controls for the industrial worker and below MCLs for groundwater.

Mission and Facility End State

All structures in M Area will be demolished as part of the EM Closure Project after evaluation per the CRMP for historic preservation and the local economic outreach initiative. The following buildings have already been identified for the local economic outreach initiative: 315-M, 316-M, and 316-1M. Below is a table showing the number of nuclear, radiological and industrial facilities in M Area. End states are shown as either demolished or in situ. This information is based on the *SRS EM D&D Plan*, which did not account for reuse by other federal facilities or economic development or for historic preservation.

M Area Totals			Current Status	End State	
Facility Haz Type	No.	Sq Ft	Comp	DEM	ISD
Nuc	0	0	0	0	0
Rad	2	32,490	0	2	0
Oth Ind	18	308,647	0	18	0
Total	20	341,137	0	20	0

Table 4.13 M-Area D&D Table

NOTE: Information provided in this table is based on the *DOE/WSRC Contract No. DE-AC09-96R18500, Modification Number 100,* and *the Savannah River Site Environmental Management Integrated Deactivation and*

Decommissioning Plan, Rev. 1, September 30, 2003. Current status is shown facilities completed as of the end of fiscal year 2003 (September 30, 2003).

4.4.12 N Area

Area Description

N Area was previously designated Central Shops and consists of about 100 acres of buildings and storage areas centrally located between the reactors and separations areas. Many of the N-Area facilities have been retired and have been designated as waste units. N-Area waste units are located in the Fourmile Branch and Pen Branch Watersheds. The current land use for N Area is site industrial.

Mission Description

N Area contains construction services facilities such as electrical, mechanical, material and equipment lay-down yards to store items until needed for new construction. In addition to construction facilities, procurement and materials management facilities are located in this area. N Area also contains some of the hazardous waste storage facilities for the site, which involves three primary operations: receipt of waste from onsite generators, interim storage, and shipment of the waste for offsite treatment and disposal. N Area is primarily comprised of heavy industrial, administrative, health and safety, and warehouse facilities. The warehouse facilities function to provide material coordination, material acquisition, and material processing for the entire site. Most N-Area facilities were originally constructed in the early 1950s and continue to provide adequate accommodations for their intended missions.

Area Hazards

N Area is positioned on a topographic and hydrogeologic divide; therefore, two conceptual site models for N-Area are provided in Figure 4.17b.1, *N-Area CSM for Fourmile Branch Watershed*, and 4.17b.2, *N-Area CSM for Pen Branch Watershed*, depicting the potential sources of contamination, migration pathways, exposure media and potential receptors. Table 4.3a, *Alternative Planned End State by Areas*, provides a listing of the N-Area waste units with associated characteristics. There are no major hazards in N Area that require remediation.

Area Cleanup Status

Table 4.3a, *Alternative Planned End State by Areas*, provides the current remedial status for the N-Area waste units and the remedial technology implemented for completed units. For waste units in the "to go" phase where the response action has not been selected, Table 4.4a, *Alternative Hazard Type Crosswalk for Area "To Go" Units*, depicts a crosswalk that categorizes each of the "to go" units" to a hazard type CSM located in Appendix K, *Conceptual Site Models for Typical Hazards*. The hazard type CSMs list the remedial technologies likely to be implemented for each hazard type. The "to go" waste units will undergo characterization, risk analysis, and evaluation for the appropriate remedial technologies.

Remediation for 13 of the 24 N-Area waste units is complete (Table 4.3). For the remaining 11 "to go" waste units, eight units are categorized as Hazard Type 5 (Nonradiological Rubble Piles and Pits), one unit as Hazard Type 6 (Nonradiological Seepage Basins), and two units as Hazard Type 9 (Miscellaneous Sites). Hazard sources to be evaluated for the remaining N-Area waste units include nonradioactive rubble and building debris, organic and inorganic constituents.

During waste unit investigations, evidence of sporadic and trace levels of organic groundwater concentrations have been observed. Further assessment/investigation is currently being

considered to determine whether or not this is a concern.

Area Planned End State Hazards

The current and projected end state for N-Area waste units is to accommodate a final risk level of 10^{-4} to 10^{-6} with institutional controls for the industrial worker.

Mission and Facility End State

N Area will remain active throughout the planning period as an industrial support area. This area would be used to consolidate maintenance activities near the center of the site, including excess warehousing operations and vehicle support maintenance from M Area. However, if there is no turnover to NNSA or major new missions, completion of the EM Closure Project will make most of the buildings and structures in N Area surplus, and any surplus building or structure will be demolished by 2025. Before any facilities are dispositioned, demolished, or in situ disposed, they will be evaluated per the CRMP for historic preservation and for the local economic outreach initiative.

Below is a table showing the number of nuclear, radiological and industrial facilities in N Area. End states are shown as either demolished or in situ. This information is based on the *SRS EM D&D Plan*, which did not account for reuse by other federal facilities or economic development or for historic preservation.

N Area Totals			Current Status	End State	
Facility Haz Type	No.	Sq Ft	Comp	DEM	ISD
Nuc	5	53,116	0	5	0
Rad	0	0	0	0	0
Oth Ind	78	864,111	0	78	0
Total	83	917,227	0	83	0

Table 4.14 N-Area D&D Table

NOTE: Information provided in this table is based on the *DOE/WSRC Contract No. DE-AC09-96R18500, Modification Number 100,* and *the Savannah River Site Environmental Management Integrated Deactivation and Decommissioning Plan*, Rev. 1, September 30, 2003. Current status is shown facilities completed as of the end of fiscal year 2003 (September 30, 2003).

4.4.13 P Area

Area Description

P Area is located in an upland area between Meyers Branch and Steel Creek approximately 2.5 miles east-southeast of the geographical center of SRS and about 4 miles west of the nearest site boundary. P-Area waste units are located in both the Steel Creek and the Lower Three Runs Watersheds.

P Area has been declared as an excess facility, and the current land use for P Area is site industrial.

Mission Description

P Area is one of five SRS reactor areas with the original mission of producing material for the Department of Defense nuclear weapons program. P Reactor is similar to other SRS reactors and has two functional areas, referred to as the exclusion area and the administrative area. The reactor exclusion area contains production buildings and facilities necessary for operational support. The area surrounding the exclusion area contains the administrative support facilities and the cooling water storage basins. The entire reactor area, both exclusion and administrative areas, is enclosed by fencing to form an operations/administrative compound. P Area is permanently shut down with no future mission. P Area is primarily comprised of industrial, administrative, and some warehouse facilities.

Most facilities were constructed in the early 1950s.

The disassembly area within the 105-P facility consists primarily of a water-filled basin with metal racks designed for vertical storage of fuel tubes and metal buckets for storing targets during operations. The basin contains several million gallons of water, and in the past it allowed the target and fuel assemblies to undergo natural radioactive decay after neutron irradiation. Currently, no irradiated or unirradiated fuel or targets are stored in the 105-P Disassembly Basin.

Area Hazards

P Area resides on a topographic and hydrogeologic divide; therefore, two conceptual site models for P-Area are provided in Figures 4.18b.1, *P-Area CSM for Lower Three Runs Watershed*, and 4.18b.2, *P-Area CSM for Steel Creek Watershed*, and depict the potential sources of contamination, migration pathways, exposure media and potential receptors. Table 4.3a, *Alternative Planned End State by Areas*, provides a listing of the P-Area waste units with associated characteristics. With the exception of G-Area waste units previously discussed with the appropriate watershed, the major hazards in P Area that require further evaluation and potential remediation are the P-Area Process Sewer Lines, P-Area Disassembly Basin, P-Reactor Seepage Basins, P-Reactor Discharge Canal, P-Reactor Area Cask Car Railroad Tracks and P-Reactor Groundwater.

Area Cleanup Status

Table 4.3a, *Alternative Planned End State by Areas,* provides the current remedial status for the P-Area waste units and the remedial technology implemented for completed units. For waste units in the "to go" phase where the response action has not been selected, Table 4.4a, *Alternative Hazard Type Crosswalk for Area "To Go" Units*, depicts a crosswalk that categorizes each of the "to go" units" to a hazard type CSM located in Appendix K, *Conceptual Site Models for Typical Hazards*. The hazard type CSMs list the remedial technologies likely to be implemented for each hazard type. The "to go" waste units will undergo characterization, risk analysis, and evaluation for the appropriate remedial technologies.

Remediation for 18 of the 30 P-Area waste units is complete (Table 4.3). For the remaining 12 "to go" waste units, six units are categorized as Hazard Type 2 (Radiological Seepage Basins and Pits), two units as Hazard Type 3 (Coal Pile Runoff Basins and Ash Basins), one unit as Hazard Type 4 (Inactive Process Sewer Lines), two units as Hazard Type 5 (Nonradiological Rubble Piles and Pits), and one unit as Hazard Type 10 (Groundwater). Hazard sources to be evaluated for the remaining P-Area waste units include radionuclides, nonradioactive rubble and building debris, organic and inorganic constituents.

Remedial technologies for groundwater are presented with each Hazard Type CSM in Appendix K, *Conceptual Site Models for Typical SRS Hazards (Soil, Groundwater, EM Facilities, and HLW Tanks*. P-Area Groundwater is the only groundwater waste units in the "to go" phase. The groundwater pathways with impacted media and receptors are shown on Figures 4.18b.1, *P-Area CSM for Lower Three Runs Watershed* and 4.18b.2, *P-Area CSM for Steel Creek Watershed*. The source of the P-Area Groundwater OU is the P-Reactor Area. Monitoring well data collected from the reactor area indicate the groundwater is contaminated with tritium, chlorinated VOCs, radionuclides, heavy metals and sulfate. Various former maintenance facilities in the P Reactor Area are the most likely contributors of the VOC contamination. P-Area groundwater with contaminants above MCLs has the potential to impact the Steel Creek IOU at the headwaters of

Steel Creek and Meyers Branch. The groundwater investigation is entering the next phase to define the extent of the contaminant plumes, and results will be evaluated with regards to IOU impact in the next IOU periodic report.

Area Planned End State Hazards

The current and projected end state for P-Area waste units is to accommodate a final risk level of 10^{-4} to 10^{-6} with institutional controls for the industrial worker and below MCLs for groundwater.

Mission and Facility End State

All hardened reactor facilities will be deactivated. All non-hardened support buildings and administrative buildings will be demolished. All temporary buildings and trailers will be removed. The Disassembly Basin will be decommissioned with an environmental cap installed. A fence around the perimeter of the remaining facilities will secure the 105-P complex in conjunction with other institutional controls.

Before any facilities are dispositioned, demolished, or in situ disposed, they will be evaluated per the CRMP for historic preservation and for the local economic outreach initiative.

Below is a table showing the number of nuclear, radiological and industrial facilities in P Area. End states are shown as either demolished or in situ. This information is based on the *SRS EM D&D Plan*, which did not account for reuse by other federal facilities or economic development or for historic preservation.

P Area Totals			Current Status	End State	
Facility Haz Type	No.	Sq Ft	Comp	DEM	ISD
Nuc	0	0	0	0	0
Rad	1	385,010	0	0	1
Oth Ind	19	272,911	0	11	8
Total	20	657,921	0	11	9

Table 4.15 P-Area D&D Table

NOTE: Information provided in this table is based on the *DOE/WSRC Contract No. DE-AC09-96R18500, Modification Number 100*, and *the Savannah River Site Environmental Management Integrated Deactivation and Decommissioning Plan*, Rev. 1, September 30, 2003. Current status is shown facilities completed as of the end of fiscal year 2003 (September 30, 2003).

4.4.14 R Area

Area Description

R Area is a 25.25 acres area located approximately 2.5 miles northeast of the geographical center of SRS. R-Area waste units are located in both the Lower Three Runs and Upper Three Runs Watersheds. In 1994, several of the support buildings including the silos were demolished and removed. The current land use for R Area is site industrial.

Mission Description

R Area is the oldest of the five SRS reactor areas with the original mission of producing material for the Department of Defense nuclear weapons program. The R-Area production reactor is permanently shutdown; however, the R Reactor building currently serves as a storage area for drums of depleted uranium. R Area is primarily comprised of nuclear industrial, administrative, and warehouse facilities. Most facilities were originally constructed in the early 1950s.

The disassembly area within the 105-R facility consists primarily of a water-filled basin with metal racks designed for vertical storage of fuel tubes and metal buckets for storing targets during operations. The basin contains about 4.5 million gallons of water and in the past the basin allowed target and fuel assemblies to undergo natural radioactive decay after neutron irradiation. Currently, no irradiated or unirradiated fuel or targets are stored in the 105-R Disassembly Basin. In the past 2 years the basin water has been processed in-situ to remove the majority of the cesium-137 and strontium-90 using innovative nuclide-specific ion-exchange technology.

Area Hazards

R Area resides on a topographic and hydrogeologic divide; therefore, two conceptual site models for the R Area are provided in Figure 4.19.b1, *R-Area CSM for Lower Three Runs Watershed*, and Figure 4.19b.2, *R-Area CSM for Upper Three Runs Watershed*, and depict the potential sources of contamination, migration pathways, exposure media and potential receptors. Table 4.3a, *Alternative Planned End State by Areas*, provides a listing of the R-Area waste units with associated characteristics. With the exception of G-Area waste units previously discussed with the appropriate watershed, the major hazards in R Area that require further evaluation and potential remediation are the R- Area Process Sewer Lines, R-Area Disassembly Basin, the Old R-Area Discharge Canal, R-Area Reactor Disassembly Basin Release and R-Area Groundwater.

Area Cleanup Status

Table 4.3a, *Alternative Planned End State by Areas,* provides the current remedial status for the R-Area waste units and the remedial technology implemented for completed units. For waste units in the "to go" phase where the response action has not been selected, Table 4.4a, *Alternative Hazard Type Crosswalk for Area "To Go" Units*, depicts a crosswalk that categorizes each of the "to go" units" to a hazard type CSM located in Appendix K, *Conceptual Site Models for Typical Hazards*. The hazard type CSMs list the remedial technologies likely to be implemented for each hazard type. The "to go" waste units will undergo characterization, risk analysis, and evaluation for the appropriate remedial technologies.

Remediation for 10 of the 33 R-Area waste units is complete (Table 4.3). For the remaining 23 "to go" waste units, eight units are categorized as Hazard Type 2 (Radiological Seepage Basins and Pits), one unit as Hazard Type 3 (Coal Pile Runoff Basins and Ash Basins), two units as Hazard Type 4 (Inactive Process Sewer Lines), five units as Hazard Type 5 (Nonradiological Rubble Piles and Pits), six units as Hazard Type 9 (Miscellaneous Sites), and one unit as Hazard Type 10 (Groundwater). Hazard sources to be evaluated for the remaining R-Area waste units include radionuclides, nonradioactive rubble and building debris, organic and inorganic constituents.

Remedial technologies for groundwater are presented with each Hazard Type CSM in Appendix K, *Conceptual Site Models for Typical SRS Hazards (Soil, Groundwater, EM Facilities, HLW Tanks*. R-Area Groundwater and the R-Reactor Seepage Basins are R-Area groundwater waste units in the "to go" phase. Groundwater beneath R Area has been contaminated by leaching of volatile organic compounds and radionuclides from area waste units above drinking water standards. The groundwater pathways with impacted media and receptors are shown on Figures 4.19b.1, *R-Area CSM for Lower Three Runs Watershed*, and 4.19b.2, *R-Area CSM for Upper Three Runs Watershed*. Groundwater characterization for R Area is ongoing and impacts to the Lower Three Runs Watershed have not been defined.

Area Planned End State Hazards

The current and projected end state for R-Area waste units is to accommodate a final risk level of 10^{-4} to 10^{-6} with institutional controls for the industrial worker and below MCLs for groundwater.

Mission and Facility End State

All hardened reactor facilities will be deactivated. The depleted uranium will be removed from the 105-R Building and transported to another area. All remaining non-hardened support buildings will be demolished. The Disassembly Basin will be decommissioned with an environmental cap installed. A fence around the perimeter of the remaining facilities will secure the 105-R Complex.

Before any facilities are dispositioned, demolished, or in situ disposed, they will be evaluated per the CRMP for historic preservation and for the local economic outreach initiative.

Below is a table showing the number of nuclear, radiological and industrial facilities in R Area. End states are shown as either demolished or in situ. This information is based on the *SRS EM D&D Plan*, which did not account for reuse by other federal facilities or economic development or for historic preservation.

R Area Totals			Current Status	End State	
Facility Haz Type	No.	Sq Ft	Comp	DEM	ISD
Nuc	2	389,775	0	1	1
Rad	1	245	0	0	1
Oth Ind	8	409,707	0	0	8
Total	11	799,727	0	1	10

Table 4.16 R-Area D&D Table

NOTE: Information provided in this table is based on the *DOE/WSRC Contract No. DE-AC09-96R18500, Modification Number 100,* and *the Savannah River Site Environmental Management Integrated Deactivation and Decommissioning Plan*, Rev. 1, September 30, 2003. Current status is shown facilities completed as of the end of fiscal year 2003 (September 30, 2003).

4.4.15 S Area

Area Description

S-Area waste facilities are located in the Upper Three Runs Watershed. The current land use for S Area is site industrial.

Mission Description

All facilities located in this area are related to HLW immobilization and interim storage. Current facilities include DWPF, Glass Waste Storage Building (GWSB) Number1, Failed Equipment Storage Vaults, and other support structures (offices, maintenance shops, equipment/material storage, etc.).

DWPF receives pretreated, high-level radioactive waste from HTF and eventually from the Salt Processing Facility and converts it, in a process called vitrification, to a stable form for safe long-term disposal. The vitrified waste is poured into stainless steel canisters that are then cooled, welded, and stored in the GWSB.

DWPF melters are operated until they fail. Failed melters are placed in specially designed storage boxes and temporarily stored in Failed Equipment Storage Vaults.

Area Hazards

The conceptual site model for S-Area is provided in Figure 4.20b, *S-Area CSM for Upper Three Runs Watershed*, and depicts the potential sources of contamination, migration

pathways, exposure media and potential receptors. Table 4.3a, *Alternative Planned End State by Areas*, provides a listing of the S-Area waste units with associated characteristics. G-Area waste units were previously discussed with the appropriate watershed. There are no major hazards in S Area that require remediation.

Area Cleanup Status

Table 4.3a, *Alternative Planned End State by Areas,* provides the current remedial status for the S-Area waste units and the remedial technology implemented for completed units. Remediation is complete for all S-Area waste units.

Area Planned End State Hazards

The current end state for S-Area waste units accommodates a final risk level of 10^{-4} to 10^{-6} with institutional controls for the industrial worker.

Mission and Facility End State

DWPF and SWPF will be deactivated by isolating utilities and filling the canyon cells with grout. In addition, all waste transfer systems and the Failed Equipment Storage Vaults will be deactivated by isolating utilities and filling with grout. Both GWSB 1 & 2 will be deinventoried. The superstructure for each of these buildings will be removed, leaving the empty underground vaults with plugs in place.

S Area will be deactivated as prelude to in-situ disposal. The structural integrity of all waste transfer pipes and systems as well as storage vaults will be stabilized with grout. The superstructure surrounding the glass waste storage buildings will be removed, leaving the empty underground vaults with plugs in place. All other buildings and structures in S Area will be demolished as part of the EM Closure Project and a perimeter fence will secure the remaining S Area facilities.

Before any facilities are dispositioned, demolished, or in situ disposed, they will be evaluated per the CRMP for historic preservation and for the local economic outreach initiative.

Below is a table showing the number of nuclear, radiological and industrial facilities in S Area. End states are shown as either demolished or in situ. This information is based on the *SRS EM D&D Plan*, which did not account for reuse by other federal facilities or economic development or for historic preservation.

S Area Totals			Current Status	End State	
Facility Haz Type	**No.**	**Sq Ft**	**Comp**	**DEM**	**ISD**
Nuc	17	383,157	0	15	2
Rad	1	225	0	1	0
Oth Ind	27	129,091	0	26	1
Total	45	512,473	0	42	3

Table 4.17 S-Area D&D Table

NOTE: Information provided in this table is based on the *DOE/WSRC Contract No. DE-AC09-96R18500, Modification Number 100*, and *the Savannah River Site Environmental Management Integrated Deactivation and Decommissioning Plan*, Rev. 1, September 30, 2003. Current status is shown facilities completed as of the end of fiscal year 2003 (September 30, 2003).

4.4.16 T Area

Area Description

The TNX Area is located 0.5 mile east of the Savannah River on an upland terrace between Upper Three Runs to the north and Fourmile Branch to the south. The site is at an elevation of 150 feet above mean sea level. Local topography is relatively flat with a slope toward the east away from the Savannah River. A

portion of the Savannah River floodplain lies immediately west of the TNX Area at 95 feet above mean sea level. All T-Area waste facilities are located in the Savannah River/Floodplain Swamp Watershed. The current land use for T Area is site industrial.

The TNX Area contains facilities and buildings and waste units that are located outside of the fenced TNX Area. The TNX Burying Ground (643-5G) was used to bury the remains of a 1953 accidental explosion of an experimental evaporator, which contained 544 kg (0.6 tons) of uranyl nitrate. The Old TNX Seepage Basin (904-76G) was in operation from 1951 through 1980. This facility was used to collect process wastewater, allowing settling of sediments in the small inlet basin and filtration through natural ion exchange media in the larger basin. Breaching the wall of the basin in 1980 released wastewater and sediments into the inner swamp, creating a delta of sediment that is now referred to as the Outfall Delta. The New TNX Seepage Basin (904-102G) replaced the Old TNX Seepage Basin after 1980.

Mission Description

This area was originally used as a staging area for receipt and testing of large process equipment destined for use in SRS production facilities. In the early 1950s, it was used to test the plutonium/uranium extraction (PUREX) process. Since that time, T Area, also known as the Multi-Purpose Pilot Plant Campus or TNX, has been utilized primarily as a pilot-scale test facility for SRNL. The most significant pilot-scale testing support has been for high-level waste initiatives, particularly DWPF. Since 1978, the area has expanded from three original buildings constructed in 1950 to 32 buildings currently located within the 14-acre fenced facility. The area is primarily comprised of light industrial, administrative, and warehouse facilities.

The Multi-Purpose Pilot Plant Campus buildings included administrative offices, process buildings for large-scale experimental demonstrations, laboratories for both research and analytical work, pilot scale facilities, bulk tank storage, industrial wastewater processing facilities, and warehouse storage for a wide range of chemical and specialty equipment. Located outside of the fenced area are additional facilities, including closed underground storage tanks; the TNX Burying Ground and Seepage Basin, currently under evaluation by the ER Program; and the New TNX Seepage Basin.

The buildings are inactive and shut down with demolition either completed or underway in all but a few buildings. The SRS "Assets-for-Services" program has removed several buildings in T Area down to their foundation by trading the facility and its assets for decommissioning services.

Area Hazards

The conceptual site model for T-Area is provided in Figure 4.21b, *T-Area CSM for Savannah River/Floodplain Swamp Watershed,* and depicts the potential sources of contamination, migration pathways, exposure media and potential receptors. Table 4.3a, *Alternative Planned End State by Areas,* provides a listing of the T-Area waste units with associated characteristics. With the exception of G-Area waste units previously discussed with the appropriate watershed, the major hazards in T Area that require further evaluation and potential remediation are the Old TNX Seepage Basin, TNX Burying Ground, TNX Process Sewer Lines, and TNX Groundwater.

Area Cleanup Status

Table 4.3a, *Alternative Planned End State by Areas,* provides the current remedial status for the T-Area waste units and the remedial technology implemented for completed units.

For waste units in the "to go" phase where the response action has not been selected, Table 4.4a, *Alternative Hazard Type Crosswalk for Area "To Go" Units*, depicts a crosswalk that categorizes each of the "to go" units" to a hazard type CSM located in Appendix K, *Conceptual Site Model for Typical Hazards*. The hazard type CSMs list the remedial technologies likely to be implemented for each hazard type. The "to go" waste units will undergo characterization, risk analysis, and evaluation for the appropriate remedial technologies.

Remediation for eight of the 17 T-Area waste units is complete (Table 4.3). For the remaining nine "to go" waste units, three units are categorized as Hazard Type 2 (Radiological Seepage Basins and Pits),two units as Hazard Type 4 (Inactive Process Sewer Lines), three units as Hazard Type 9 (Miscellaneous Sites), and one Hazard Type 10 (Groundwater). Hazard sources to be evaluated for the remaining T-Area waste units include radionuclides, nonradioactive rubble and building debris, radionuclides, organic and inorganic constituents.

Remedial technologies for groundwater are presented with each Hazard Type CSM in Appendix K, *Conceptual Site Models for Typical Hazards*. Groundwater in T Area is contaminated with carbon tetrachloride, PCE, and TCE above MCLs with a potential to discharge to surface water. TCE has been detected at the seep line in the Savannah River Swamp where the groundwater plume crops out. However, no constituents from the plume have been detected in the Savannah River or any offsite groundwater. Groundwater is also contaminated with chloroform above risk-based levels but does not exceed MCLs and therefore does not require action. There is also a small region of mercury contamination in the groundwater that generally exceeds the MCL with no discernable source. The groundwater pathways with impacted media and receptors are shown on Figure 4.21b, *T-Area CSM for Savannah River/Floodplain Swamp Watershed*. Groundwater characterization for T Area is ongoing and impacts to the Savannah River/Floodplain Swamp Watershed have not defined.

Area Planned End State Hazards

The current and projected end state for T-Area waste units is to accommodate a final risk level of 10^{-4} to 10^{-6} with institutional controls for the industrial worker and below MCLs for groundwater.

Mission and Facility End State

All buildings and structures in T Area will be demolished and any contamination of the soil and groundwater will be addressed. Below is a table showing the number of nuclear, radiological and industrial facilities in T Area. End states are shown as either demolished or in situ. This information is based on the *SRS EM D&D Plan*, which did not account for reuse by other federal facilities or economic development or for historic preservation.

T Area Totals			Current Status	End State	
Facility Haz Type	No.	Sq Ft	Comp	DEM	ISD
Nuc	0	0	0	0	0
Rad	0	0	0	0	0
Oth Ind	29	161,732	24	29	0
Total	29	161,732	24	29	0

Table 4.18 T-Area D&D Table

NOTE: Information provided in this table is based on the *DOE/WSRC Contract No. DE-AC09-96R18500, Modification Number 100*, and *the Savannah River Site Environmental Management Integrated Deactivation and Decommissioning Plan*, Rev. 1, September 30, 2003. Current status is shown facilities

completed as of the end of fiscal year 2003 (September 30, 2003).

4.4.17 Z Area

Mission Description

Z Area is composed of operating facilities used to treat and dispose of the low radioactivity salt solution resulting from selected salt disposition alternative pre-treatment processes and the concentrate from ETP. The area includes the Saltstone Manufacturing Plant and Saltstone Disposal Vaults. Z Area is primarily comprised of light nuclear industrial, administrative, and warehouse facilities. Currently, the Saltstone Facility is restarting to process accumulated feed from ETP. The Saltstone Manufacturing Plant blends a low radioactivity salt solution with cement, slag, and fly ash to create a mixture that hardens into a concrete-like material called saltstone. It treats liquid waste residuals from ETP. This plant works in conjunction with the Saltstone Disposal Vaults, large concrete disposal crypts into which the solution prepared in the Saltstone Manufacturing Plant is pumped. After cells in the vault are filled, they are sealed with concrete. Eventually, the vaults will be covered with soil, and a cap constructed of clay and other materials will be installed over the vaults to reduce rainwater infiltration and leaching of contaminants into the groundwater.

Area Hazards

The CSM for Z Area is provided in Figure 4.22b, *Z Area CSM for Upper Three Runs.* There are no waste units in Z Area.

Area Cleanup Status

Since there are no waste units in Z Area, there is no remediation ongoing or planned.

Mission and Facility End State

The grout plant will be closed by isolating process equipment and filling with grout where appropriate. All administrative facilities will have been deactivated and decommissioned, and above ground support systems, which present significant hazards, will have been removed. A perimeter fence will secure the remaining Z-Area facilities.

Before any facilities are dispositioned, demolished, or in situ disposed, they will be evaluated per the CRMP for historic preservation and for the local economic outreach initiative.

Below is a table showing the number of nuclear, radiological and industrial facilities in Z Area. End states are shown as either demolished or in situ. This information is based on the *SRS EM D&D Plan*, which did not account for reuse by other federal facilities or economic development or for historic preservation.

Z Area Totals			Current Status	End State	
Facility Haz Type	No.	Sq Ft	Comp	DEM	ISD
Nuc	4	191,102	0	2	2
Rad	0	0	0	0	0
Oth Ind	10	17,553	0	10	0
Total	14	208,655	0	12	2

Table 4.19 Z-Area D&D Table

NOTE: Information provided in this table is based on the DOE/WSRC Contract No. DE-AC09-96R18500, Modification Number 100, and the Savannah River Site Environmental Management Integrated Deactivation and Decommissioning Plan, Rev. 1, September 30, 2003. Current status is shown facilities completed as of the end of fiscal year 2003 (September 30, 2003).